

DAMODAR VALLEY CORPORATION

ANDERSON HOUSE

ALIPORE, CALCUTTA - 27

REPORT OF THE NAVIGATION ADVISORY COMMITTEE



VOLUME II

CALCUTTA

JUNE—1958

VOLUME II.

Proceedings of the Meetings.
Financial Analysis and Forecast.
Draft Rules and Regulations
Drawings.



INDEX**VOLUME II.****APPENDIX I.**

Page No.

D.V.C. Navigation Advisory Committee Meetings—

Proceedings of the First Meeting	...	...	...	...	...	1
Do. Second Meeting	...	...	...	...	...	2
Do. Third Meeting	...	...	...	...	...	5
Do. Fourth Meeting	...	...	...	...	...	8
Do. Fifth Meeting	...	...	...	...	...	10
Do. Sixth Meeting	...	...	...	...	...	12

APPENDIX II.**Formation of Sub-Committees, terms of references and their reports—**

A. Traffic Promotion Sub-Committee	14
B. Boating Organisation and Canal Navigation Sub-Committee	...	...	...	...	18
C. Conservancy and Harbour Development Sub-Committee	...	...	...	...	20
D. Coal Sub-Committee	...	...	...	...	22
E. Sub-Committee for Determination of the shape and sizes of barges and tugs	...	...	...	...	23
F. Sub-Committee for the examination of the freight structure	...	...	...	...	25

APPENDIX III.

Financial analysis and forecast of the D.V.C. Navigation Canal Operation Scheme	28
---	----

APPENDIX IV.

Draft rules and regulations	38
-----------------------------	-----	-----	-----	-----	-----	----

Number of Statements and Drawings Attached.

I—VIII

INDEX Map of Navigation Canal	...
-------------------------------	-----

One

APPENDIX I.

MINUTES OF THE 1ST MEETING OF THE NAVIGATION ADVISORY COMMITTEE
HELD IN THE ROOM OF SRI A. B. GANGULI, MEMBER, D.V.C. ON 16-7-1956 AT
3 P.M.

The following were present :

1. Sri A. B. Ganguli, I.C.S., Chairman, D.V.C. Navigation Advisory Committee.
2. Sri L. M. Hogan, Traffic Manager, Calcutta Port Commissioner.
3. Sri I. G. Chacko, Secretary, G.B.W.T. Board.
4. Commander C. J. Mohan, Dy. Conservator, Calcutta Port Commissioners.
5. Capt. V. V. Javadekar, Senior Nautical Surveyor representing Principal Officer, M.M.D.
6. Sri J. M. Majumdar, Navigation Adviser, D.V.C.
7. Sri I. B. De, I.S.E., Chief Engineer, West Bengal.
8. Sri R. S. Bhattacharjee, Movement Sponsoring Authority and Principal Liaison Officer, West Bengal Government.
9. Sri A. K. Bhaumik, Chief Electrical Engineer, West Bengal Government.
10. Sri S. M. Banerjee, I.A. & A.S., Financial Adviser, D.V.C.
11. Sri A. L. Das, I.S.E., Addl. Chief Engineer & Member-Secretary, D.V.C. Navigation Advisory Committee.

1. The Chairman welcomed the members and explained the back-ground of the Navigation Scheme, its possibilities and present position. The main problems are :—

- (a) Maintenance of Waterway.
- (b) Dredging of Kunti River.
- (c) Development of an Inland Harbour at Durgapur and location of loading and unloading berths at intermediate points.
- (d) Development of trade and industry in the canal zone.
- (e) Setting up of a suitable Boating Organisation.

2. Commander Mohan stated that it would be possible for the Port Trust to mark Navigation Channel from Out Fall at Kunti upto New Howrah Bridge. There are three Shoals between Howrah Bridge and Outfall of Kunti. No difficulty in Navigation is expected excepting at Halisahar Shoal and that also at low tide.

2A. Sri I. B. De, Chief Engineer, Irrigation and Waterways Directorate stated that it would be possible to spare the Dredger Burdwan after December, 1956 for dredging of Kunti.

3. Sri Hogan stated that probable traffic may be classified commoditywise so that suitable space for loading and unloading may be allocated in the Port area. Navigation Adviser agreed to supply Sri Hogan necessary particulars of traffic likely to develop.

4. The setting up of a suitable boating organisation was discussed at great length. It was agreed that the views of various companies interested in Canal Navigation should be

obtained and in order to do so, the Navigation Advisory Committee would meet them sometime next month. A sub-committee would then be formed to formulate details regarding organisation, rules, type of craft with due reference to canal sections and soil, etc. The Navigation Adviser would draft a circular which will be sent by the Secretary to various shipping companies. Navigation Adviser was of the opinion that in the initial stage existing craft now plying on River Hooghly might undertake exploratory trips inside the canal.

5. As development of canal traffic will depend on the establishment of industries and trade centres along the water front, it was agreed that the Government of West Bengal should be requested to sponsor schemes for setting up Rice Mills, Sugar Mills, Ware Houses for Agricultural Produce, etc., along the canal.

6. The question of locomotion of boats inside the canal was next discussed. Capt. Javadekar suggested electric traction from shore as had been done in Panama Canal. It was decided that the feasibility of its adoption might be looked into. The Navigation Adviser would collect the data and consult Additional Chief Engineer. This was suggested in order to prevent erosion of banks and in order to effect speedier movement.

7. Sri Chacko agreed to supply all available data regarding types of boat and tugs proposed for Navigation between Patna and Buxar—later on to be extended upto Allahabad and Kanpur.

8. Sri J. M. Majumdar and Sri K. Mitra were co-opted as Members of the Navigation Advisory Committee. It was decided to request the Government of West Bengal to nominate the Director of Industries to serve as a Member of the Committee.

Sd/- A. L. Das,
Member-Secretary.

Sd/- A. B. Ganguli,
Chairman.



MINUTES OF THE 2ND MEETING OF THE NAVIGATION ADVISORY COMMITTEE
HELD IN THE ROOM OF SRI A. B. GANGULI : DAMODAR VALLEY CORPORATION
ON 17-8-1956 AT 3 P.M.

The following were present : —

- (1) Sri A. B. Ganguli, I.C.S., Chairman, D.V.C., Navigation Advisory Committee.
- (2) Sri T. B. Bose, I. N. Principal Officer, Mercantile Marine Deptt., Calcutta.
- (3) Capt. V. V. Javadekar, Senior Nautical Surveyor, M.M.D.
- (4) Sri R. S. Bhattacharjee, Movement Sponsoring Authority and Principal Liaison Officer, Government of West Bengal.
- (5) Sri S. Dutta, Superintending Engineer, Government of West Bengal.
- (6) Sri S. Gupta, Superintending Engineer, Government of West Bengal.
- (7) Sri A. K. Bhaumick, Chief Electrical Engineer, Government of West Bengal.
- (8) Sri B. Sarkar, Commissioner, Burdwan Division.
- (9) Sri K. Narayanan, Deputy Secretary, Ministry of Transport & Secretary, G.B.W.T. Board.

- (10) Sri S. P. Sarathy, River Surveyor, Calcutta Port Commissioners.
- (11) Sri A. L. Das, I.S.E., Chief Engineer, & Member-Secretary, D.V.C. Navigation Advisory Committee.
- (12) Sri J. M. Majumdar, Navigation Adviser, D.V.C.
- (13) Sri B. C. Mallik, Director of Industries, Government of West Bengal.
- (14) Sri K. Sen on behalf of M/s. R. Sen & Co.
- (15) Sri N. C. Ghosh, India River Transport Co.
- (16) Sri W. T. Martin on behalf of M/s. Joint Steam Navigation Co.
- (17) Sri P. C. Sur, { On behalf of
- (18) Sri S. K. Das Gupta, { M/s. Indo Swiss Trading Co., Ltd.

1. The proceedings of the first meeting of the Navigation Advisory Committee held on 16-7-56 were confirmed.
2. The Chairman welcomed the representatives of Boating Companies who had responded to D.V.C.'s invitation and attended the meeting.
3. The Chairman briefly explained the nature of Boating Organisation that will operate in the Durgapur Navigation Canal. Last year the D.V.C. issued advertisements, calling for tenders to undertake navigation in the canals. The response to the advertisement was very poor. A group of industries have now been planned at Durgapur and as such the prospects of canal traffic were bright. During the first five years the volume of traffic may be insignificant but by the end of 20 years the target of two million tons of traffic was likely to materialise. Moreover the possibilities of movement of coal by water from Ondal Coal Fields was under careful investigation. The collieries in Ondal area will have to transport a very large quantity of sand from the Damodar river. If movement of coal could be arranged in the reverse direction by aerial wire rope or by road transport the movement of sand and coal could be done at attractive rates if the way traffic could be arranged.
4. The Chairman stated that granting of monopoly to one Company was not likely. The D.V.C. will however encourage several boating companies possessing necessary equipments to work in the canal observing terms and conditions as may be laid down by the Corporation.
5. The Navigation Adviser described the Boating Organisation in greater detail with special reference to the nature and type of Cargo, Boats, Tugs, etc. He mentioned that the rate of freight on boats and regularity of supply of boats would be the most important factors in the development of canal traffic.
6. Sri N. C. Ghose stated that the scope and function of boating organisation under the Private Sector and the Public Sector should be defined in order to avoid a harmful competition. Sri Ghose suggested that there should be an agreement for at least 25 years, so that the private Sector could be interested in building new crafts of which there was an acute shortage at present.

6. Sri Martin stated that if no toll charges were levied by the D.V.C. his company would be interested in the development of Canal Navigation. The representatives of other companies stated that if it was not possible to exempt boats from payment of canal dues the D.V.C. should impose a nominal toll charge.

7. The cost of providing a fleet of boats and tugs was discussed. It appeared that initially a sum of Rs. 30/- lacs will have to be invested either by a single company or by a group of companies to launch the scheme.

8. Sri Bhattacharjee suggested formation of a central pool of vessels by the private sector for different types of cargo. If there was a combine of 3 or 4 interested companies with equal investments the canal traffic could be properly developed.

9. In course of discussion some of the boating companies stated that they were prepared to form a pool of boats and form a Joint Boating Organisation if D.V.C. were prepared to levy nominal toll charges and were also prepared to develop terminal facilities with mechanical equipment wherever necessary to promote canal traffic and provide transit sheds and warehouses.

10. Representatives of trade present at the meeting particularly of M/s. R. Sen & Co. Indo Swiss Trading Company stated that an investment of 10 to 15 lacs each would be forthcoming provided the trade is guaranteed operation for a minimum period of 15 years at a low tollage charge.

11. Sri Martin enquired if it was not possible to organise mechanical towage from shore for the movement of boats inside the canal instead of depending on tugs and launches. The Navigation Adviser and the Additional Chief Engineer stated that the matter was under investigation.

12. As regards freight charges on boats it was explained by Sri Martin that for short distance movement of traffic, water transport was comparatively expensive and he worked out that the boating freight from Durgapur to Calcutta would amount to 16 Pies per ton per mile as against average ten pies per ton per mile on Railway freight. Moreover the freight on boats would be higher in the case of navigation canal on account of delays at various locks.

13. Sri Kalyan Sen stated that at present there was a tendency of fall in freight rates on Road Transport and Lorry hire between Asansol and Calcutta.

14. The Navigation Adviser stated that the development of canal transport depended on a planned development of industries and trade immediately on the banks of the Navigation canal so that direct loading and unloading from the boats into factories, godown and warehouses could be arranged, thereby avoiding the cost of intermediate transport.

15. The Chairman stated that the Committee would meet again in a fortnight time and tentatively Friday on 7th September was suggested as the date of next meeting.

Sd/- A. L. Das,
Member-Secretary.

Sd/- A. B. Ganguli,
Chairman.

Minutes of the Third Meeting of the D.V.C. Navigation Advisory Committee held in the room of Sri P. P. Verma, Chairman, D.V.C. on 18-9-56 at 3 P.M.

The following were present :—

- (1) Sri P. P. Verma, Chairman, D.V.C.
- (2) Sri A. B. Ganguli, I.C.S., Member, D.V.C., Chairman, D.V.C., Advisory Committee.
- (3) Capt. V. V. Javadekar, Senior Nautical Surveyor, representing Principal Officer, M.M.D.
- (4) Sri R. S. Bhattacharjee, Movement Sponsoring Authority & Principal Liaison Officer, Government of West Bengal.
- (5) Sri S. Gupta, Superintending Engineer, representing Chief Engineer, Road Development, Government of West Bengal.
- (6) Sri S. Dutta, Superintending Engineer, representing Chief Engineer, Irrigation and Waterways Directorate, Government of West Bengal.
- (7) Sri S. P. Sarathy, representing Traffic Manager, Commissioners for the Port of Calcutta
- (8) Sri B. Sarkar, Commissioner, Burdwan Division.
- (9) Sri S. Banerjee, I.A. & A.S., Financial Adviser, D.V.C.
- (10) Sri A. L. Das, I.S.E., Addl. Chief Engineer, D.V.C.
- (11) Sri J. M. Majumdar, Navigation Adviser, D.V.C.

1. The Chairman apologised for cancellation of the date of the third meeting originally proposed on 7-9-56 which was due to unavoidable circumstances.

2. The letter No. D/D-1/75 dated 1-9-56 from Sri W. T. Martin of M/s. I. G. N. R. Ltd. was taken for discussion and it was agreed upon to substitute the portion "if no toll charges to canal navigation" appearing in the minutes of the 2nd meeting, by "owing to all the Joint Steamer Companies' boating fleet being fully engaged on the Jute trade on the Hooghly and in the clearing the heavy imports, being shipped into the country at present, no vessels could be spared for the proposed service on the D.V.C. Navigation Canal. To participate on this service, it would be necessary for the Joint Steamer Companies to undertake new construction at a considerable capital cost.

Even were this fleet to be built, we could not possibly operate it economically on the D.V.C. Canal. Due to the length of the turnaround time the service could not bear any toll charges.

Furthermore any new investments which the Companies may be able to lay out in the near future, would have to go into new construction to meet our already heavy commitments, and to accommodate further recent increased allotments of traffic on the Assam route" mentioned in the said letter under reference.

The minutes of the 2nd meeting dated 17-8-56 was then confirmed with the above amendment.

3. The feasibility of adopting Electric mules for traction of barges and lighters was discussed by Sri R. S. Bhattacharee and Capt. V. V. Javadekar. In view of the ultimate savings in recurring expenses claimed, the scheme should be examined.

It was pointed out by Sri A. L. Das that the bridges along the Navigation Canal would require replacement as these were inadequate from the point of view of width & loading for such purposes. Sri Das informed the members that references have already been made for collection of details for mules employed in Panama Canal, and after these were received the overall economy would be investigated as to whether or not electric mules could be employed in the canal.

4. Desirability of allowing country boats was then discussed. It was pointed out by Sri Sarathy that country boats carrying perishable food stuff are allowed to enter Docks under special circumstances only. This aspect should be given due consideration in framing our canal rules.

5. As regards formation of Sub-Committees, Chairman (Sri Ganguli) proposed formation of another Sub-Committee to deal with studying the problem of coal movement, thus increasing the number of Sub-Committees to four.

The nomenclatures of the Sub-Committees were amended and the convenor and members of the Sub-Committees selected are as under :—

A. Traffic Promotion Sub-Committee :

Convenor

Sri B. C. Mallik,
Director of Industries,
Government of West Bengal.

Members :

- (1) Sri B. Sarkar,
Commissioner, Burdwan Division.
- (2) Sri J. N. Talukdar,
Secy. Home Deptt. & Director
General of Transport,
Government of West Bengal.
- (3) Sri R. C. Roy,
Chief Engineer, Roads,
Government of West Bengal.
- (4) Sri S. R. Ghose,
Superintending Engineer,
Barrage and Canal, D.V.C.

B. Coal Sub-Committee :

Convenor

Sri J. M. Majumdar,
Navigation Adviser, D.V.C.

Members :

- (1) Sri A. B. Ganguli,
Member, D.V.C.
- (2) Sri S. M. Banerjee.
Financial Adviser, D.V.C.
- (3) Sri R. S. Bhattacharjee,
Movement Sponsoring Authority &
Principal Liaison Officer,
Government of West Bengal.

C. Boating Organisation & Canal Navigation Sub-Committee :

Convenor

Sri A. L. Das, Addl. Chief Engineer, D.V.C.

Members :

- (1) Sri J. G. Chacko,
Secretary, G.B.W.T. Board.
- (2) Capt. T. B. Bose, I. N. Principal
Officer, Mercantile Marine Deptt.
- (3) Sri I. B. Dey, Chief Engineer,
Irrigation and Waterways Directorate,
Government of West Bengal.

D. Conservancy & Harbour Development Sub-Committee :

Convenor

Sri A. L. Das, Addl. Chief Engineer, D.V.C.

Members :

- (1) Sri L. M. Hogan,
Traffic Manager, Calcutta Port
Commissioners.
- (2) Commander C. J. Mohan,
Deputy Conservator, Calcutta Port
Commissioners.
- (3) Capt. T. B. Bose, I. N. Principal Officer,
Mercantile Marine Deptt.

7. The Chairman desired that a report on the working of the Sub-Committees be submitted within 3 months, i.e. by the end of December, '56.

8. The next meeting is proposed to be held in early part of November '56 to review the progress achieved.

Sd/- A. L. Das.
Member-Secretary.

Sd/- A. B. Ganguli.
Chairman.

Minutes of the 4th Meeting of the D.V.C. Navigation Advisory Committee held on 28-12-56.

Present :

- (1) Sri A. B. Ganguli, Member, D.V.C.—Chairman.
- (2) Sri R. C. Roy, Chief Engineer, Roads, West Bengal—Member.
- (3) Sri S. M. Banerjee, Financial Adviser, D.V.C.—Member.
- (4) Sri B. C. Mallik, Director of Industries, Government of West Bengal.—Member.
- (5) Sri P. S. Vanchiswar, Nautical Surveyor, M.M.D., representing Principal Officer—
- (6) Sri L. M. Hogan, Traffic Manager, Calcutta Port Commissioners.—Member.
- (7) Commander C. J. Mohan, Deputy Conservator, Calcutta Port Commissioners.—Member.
- (8) Sri J. M. Majumdar, Navigation Adviser, D.V.C.—Member.
- (9) Sri D. Mookerjee, Member-Secretary.

The minutes of the third meeting were confirmed. It was further decided by the Committee that Sri D. Mookerjee, Member-Secretary of the Committee will act as Convenor of the following Sub-Committees in place of Sri A. L. Das, who has left the D.V.C. on reversion to West Bengal Government :—

(a) Conservancy and Harbour Development Sub-Committee.

(b) Boating Organisation and Canal Navigation Sub-Committee.

2. Member-Secretary then explained the progress made by the then Sub-Committees. It was pointed out by him that the Traffic Promotion Sub-Committee could not meet at all as Sri B. C. Mallik, Director of Industries, West Bengal, who is the Convenor of the Sub-Committee was out of India during the last few weeks. Sri Mallik was requested by the Chairman to convene a meeting early and to submit their recommendation.

3. Report from Coal Sub-Committee :

The report submitted by the Convenor, Sri J. M. Majumdar was considered. As it did not contain any basic facts and figures, Sri Majumdar was requested to collect the agencies and industries who handle coal in the Calcutta area as well as for bunkering. Sri Majumdar was also requested to determine the approximate cost of transport of coal from pit head to Durgapur by aerial ropeway or such other feasible methods and thence to Calcutta by the canal route.

1. Report from Conservancy and Harbour Development Sub-Committee.

The recommendations made by the Sub-Committee were considered and generally approved by the Committee. The D.V.C. should now arrange for additional acquisition of land for an additional lock at each lock site.

Commander Mohan of Calcutta Port Commissioners also agreed to carry out periodical hydrographic surveys in the stretch of the Hooghly from Calcutta to Kunti outfall and keep proper watch on the behaviour of the river in this portion. Commander Mohan also suggested that facilities for providing some slipway for carrying out repairs, painting, etc. of the boats should be provided. The Director of Industries was requested to finalise their proposed plan of barge building at Durgapur so that these facilities can be made available for repairs and maintenance.

It was agreed that the existing facilities at the Calcutta Port should be sufficient for the present needs.

5. **Report of Boating Organisation and Canal Navigation Sub-Committee.**

The recommendations of the Sub-Committee were considered. It was agreed that before the West Bengal Government could be approached about the proposed Development Corporation, the Sub-Committee might give an indication of the economics of the scheme stating in particular—(i) the initial and ultimate capital outlay keeping in view the gradual development of traffic (ii) the anticipated return after meeting all costs viz. the interest charges, operation maintenance charges and depreciation cost.

It was further agreed that introduction of night navigation should improve the turn-round time considerably and would reduce the cost not only for operation but also for the initial capital outlay.

Commander Mohan stated that introduction of haulage by mechanical mules would increase the speed and therefore reduce the turn-round time. It was explained by the Member-Secretary that introduction of mechanical mules would require remodelling of all the bridges, construction of suitable roadway on both banks of the canal as well as lining of the canal banks. This will involve considerable capital expenses. Experience in other countries does not also suggest introduction of similar haulage method which is likely to be less economic.

Sri Majumdar was requested to finalise the draft rules as well as realistic traffic survey and study of economics of the canal transport.

6. Member-Secretary proposed that the D.V.C. may be requested to include a representative from the :—

- (i) Ministry of Railways.
- (ii) Ministry of Transport.
- (iii) Ministry of Commerce and Industries.
- (iv) Planning Commission.

as Members of the Main Committee as well as in the Sub-Committees.

This was agreed by the Committee.

Sd/- A. B. Ganguli,
Chairman.

Minutes of the 5th Meeting of the Navigation Advisory Committee held on 18-4-57 at 10-30 A.M. in the room of Chairman, D.V.C., at Anderson House, Alipore.

Sri P. S. Rau, I.C.S., Chairman, D.V.C. took the Chair and Sri P. P. Varma, Member, D.V.C., was also present on special request.

Members Present :—

- (1) Sri A. B. Ganguli, I.C.S., Member, D.V.C., Chairman, Navigation Advisory Committee.
- (2) Sri S. M. Banerjee, Financial Advisor, D.V.C.
- (3) Sri K. Narayanan, Deputy Secretary, Ministry of Transport & Secretary, Ganga-Brahmaputra Water Transport Board.
- (4) Sri N. Roy Chowdhury, I.C.S., Commissioner, Burdwan Division.
- (5) Sri A. L. Das, I.S.E., Chief Engineer, Irrigation & Waterways Directorate, Government of West Bengal.
- (6) Sri S. N. Gupta, Superintending Engineer, representing Chief Engineer Road Development, Government of West Bengal.
- (7) Sri A. K. Bhowmick, Electrical Engineer, Member, State Electricity Board, Government of West Bengal.
- (8) Capt. V. V. Javadekar, representing Principal Officer, Mercantile Marine Department.
- (9) Sri R. S. Bhattacharee, Movements Sponsoring Authority and Principal Liaison Officer, West Bengal.
- (10) Sri B. C. Mallik, Director of Industries, Government of West Bengal.
- (11) Sri Anand Mohan, Chief Commercial Superintendent, Eastern Railway.
- (12) Sri S. P. Sarathy—representing Comdr. C. J. Mohan, Deputy Conservator, Calcutta Port Commissioners.
- (13) Sri J. M. Majumdar, Navigation Adviser, D.V.C.
- (14) Sri D. Mookerjee, Deputy Chief Engineer, D.V.C., Member-Secretary.

1. The minutes of the 4th meeting of the Committee were confirmed with a minor modification in para 4, where Sri Parthasarathy suggested replacement of the word “quarterly” by “frequent.” The portion of the sentence will thus read “to carry out frequent hydrographic surveys in the stretch of Hooghly”

2.1. The recommendations of the Traffic Promotion Sub-Committee were generally approved. So far as the recommendation of No. 6 was concerned it was suggested that in the event of no such Board existing under the West Bengal Government, an Ad hoc Board might be set up by the Government in consultation with D.V.C. The function of the Board would be to collate information regarding industrial potential in the area adjoining the Navigation Canal, to arrange for facilities to the prospective Industries and to promote industrial development of the area.

2.2. The Chairman desired that appreciation of the Committee should be communicated to the members of the Traffic Promotion Sub-Committee for the excellent report submitted by them.

3.1. The Financial prospects of the Damodar-Hooghly Navigation Canal prepared by Sri D. Mookerjee of the Damodar Valley Corporation was then discussed. This attracted considerable attention of the members present.

3.2. Capt. Javadekar suggested that the word "fast moving" occurring in page 2 should be defined in a more rigid way and the Chairman requested him to furnish an appropriate amendment.

3.3. Sri Anand Mohan, representing the Railways, pointed out that the present volume of traffic in the area, and the traffic potentialities of the Scheme, required further verification, especially in view of the fact that the same figure has been adopted now as was done about two years back. He desired that a break up of 1 million ton coal which has been assumed as the anticipated canal traffic be furnished. Sri Majumdar, Navigation Adviser, D.V.C., was requested to get in to touch with Sri Anand Mohan and to try to have an agreed set of figures regarding the anticipated traffic.

3.4. The representative of the MMD suggested that the size of barges and tugs as assumed should be more critically examined and if necessary model tests carried out. Sri Mookerjee explained that for the purpose of preparing the financial forecast the present conventional sizes were considered. If, any major deviation or change from the already tested size, shape and type of barges and tugs, was contemplated then only the question of further model testing would be necessary. As this model testing would take considerable time it was proposed to adopt the conventional and standard size and shape of tugs and barges to start with. These would fit in with the dimensions of the locks. After some discussions it was decided to form a Sub-Committee which would go into the question more critically and submit its recommendations to the main Committee.

The Sub-Committee will consist of :

- (1) A representative of the Mercantile Marine Deptt.
- (2) A representative of the Port Commissioners.
- (3) Sri J. M. Majumdar, Navigation Adviser, D.V.C.
- (4) Sri D. Mookerjee, Member-Secretary, D.V.C. Navigation Advisory Committee.

3.5. This Sub-Committee will also go into the question of (i) feasibility of the method of towing two barges at a time as has been assumed and (ii) determination of the maximum number of empty barges that could be towed during the return journey, without serious detriment to the canal banks.

3.6. While agreeing in general to the freight structure of coke and coal Sri Anand Mohan stated that he had no comment to make except that the labour charge of -/12/2½ p. per ton of coal as assumed, was levied as welfare cess by the Government which might have to be paid by the I.W.T. also. It was decided that the freight structure should be critically examined by another Sub-Committee consisting of :

- (1) A representative of the Railways.
- (2) The movement Sponsoring Authority and Principal Liaison Officer.
- (3) Navigation Adviser, D.V.C.
- (4) Sri D. Mookerjee, Member-Secretary, Navigation Advisory Committee.

3.7. The initial cost of barges, tugs, maintenance and overhead charges, that have been assumed, were considered to be on the low side. It was decided that the Sub-Committee set up for the shape and size of barges should also go into this aspect and consult the authorities having reliable information on this subject.

4.1. It was decided that the draft rules prepared by Sri J. M. Majumdar should be examined by the Sub-Committee referred to in para 3.4 before it can be considered by the Navigation Advisory Committee.

5.1. Sri Ganguli next explained in detail the previous discussions about the formation of a suitable Boating Organisation. It was agreed that a Boating Organisation should not be left entirely in the hands of D.V.C. nor in the hands of West Bengal Government alone. It was suggested that a Board consisting of representatives of D.V.C. and Government of West Bengal may be set up. This Board, when formed, may consider if the private sector should also be invited to participate in the scheme.

Sd/- D. Mookerjee.
Member-Secretary.

Proceedings of the Sixth meeting of the D.V.C. Navigation Advisory Committee, held on 14th September, 1957 at 11 A.M. in the room of Sri A. B. Ganguly, I.C.S., Member, Damodar Valley Corporation, at Anderson House, Alipore.

Members Present :

- (1) Sri A. B. Ganguli, I.C.S., Member, Chairman, Navigation Advisory Committee.
Damodar Valley Corporation.
- (2) Sri A. L. Das, I.S.E., Chief Engineer, Member.
Irrigation & Waterways Directorate,
Government of West Bengal.
- (3) Sri B. C. Mallik, Director of Industries, Member.
Government of West Bengal.
- (4) Sri J. M. Majumdar, Navigation Member.
Adviser, Damodar Valley Corporation.
- (5) Capt. V. V. Javadekar, Representing
Principal Officer, Mercantile Marine
Department.
- (6) Sri P. N. Batra, Assistant Conservator,
Calcutta Port Commissioners, Representing
Deputy Conservator, Calcutta
Port Commissioners.

- (7) Sri N. Roy, Deputy Chief Commercial Superintendent, Eastern Railway, Representing Chief Commercial Superintendent, Eastern Railway.
- (8) Sri D. Mookerjea, Deputy Chief Member-Secretary. Engineer, Damodar Valley Corporation.

Sri K. R. A. Raman, I.C.S., Member, Damodar Valley Corporation, was also present on special invitation.

At the outset the Chairman expressed disappointment for poor attendance though sufficient notice was given for this important meeting.

Chairman explained that the work allotted to most of the Sub-Committees were completed.

A summarised note embodying the recommendations against the various functions of the committee had been circulated among the members after the fifth meeting. A revised Financial Forecast, drawn up by Sri D. Mookerjea, amended on the lines suggested by the Committee during the Fifth meeting had also been circulated before the meeting.

The Chairman made a review of the previous decision taken by the Committee. The discussions then centred round the revised Financial Forecast. It was decided that after certain minor modifications, as suggested by the members the forecast might be accepted.

It was recommended that there should be a separate Boating Organisation with plenary powers for running the transport services. This Organisation should be set up by the Government of West Bengal in collaboration with the D.V.C. on terms to be mutually agreed upon. They might also consider collaboration of the Private Sector.

Sri D. Mookerjea explained in detail the progress made regarding studies for the movement of coal with particular reference to its carriage from the pit head to the canal head.

Chairman next desired that the final recommendations of the committee on its terms of references should be drawn up, and circulated among the members, for early presentation to the Government of West Bengal.

Chairman thanked all the members for their useful contribution in the work of the committee and of the various sub-committees.

Sd/- D. Mookerjea.
Member-Secretary.

APPENDIX II

Formation of Sub-Committee, terms of references and their reports.

A. Traffic Promotion Sub-Committee

Convenor :

Sri B. C. Mallik,
Director of Industries,
Government of West Bengal.

Members :

(1) Sri B. Sarkar, I.A.S.,
Commissioner, Burdwan Division.

(2) Sri J. N. Talukdar, I.C.S.,
Secretary, Home Department &
Director General of Transport,
Government of West Bengal.

(3) Sri R. C. Roy,
Chief Engineer, Roads,
Government of West Bengal.

(4) Sri S. R. Ghose,
Superintending Engineer,
Barrage & Canals, D.V.C.

(Subsequently Shri R. Gupta, I.C.S., Transport
Commissioner, West Bengal represented Sri
N. Talukdar, I.C.S.)

Terms of reference :

- (a) Development of road connection.
- (b) Whether the road links to canal terminals be taken over by state or remain with District Board.
- (c) Authority for local permit for public carriers to use link roads.
- (d) Location of loading and unloading berths.
- (e) Facilities to be provided on loading and unloading berths.

(f) Development of Industries and trade centres along Canal Bank.

(g) Studying the problem of Coal movement.

Recommendations of the Traffic Promotion Sub-Committee of the D.V.C. Navigation Advisory Committee.

(1) Development of road connection :

This is a **MUST**

(2) Whether the road links to canal terminals be taken over by State or remain with District Board.

(i) All road links to canal terminals should be taken over by the State.

(ii) Road links from the G. T. Road to canal terminals, which are still to be developed should be taken over by the State Government in the Second Five Year Plan since the total length of such roads is not likely to exceed 4/5 miles.

(3) Authority for local permit for public carriers to use link roads:

This should rest with the authority at present working in the respective areas.

(4) Location of loading and unloading berths :

The members visited most of the suggested locations and their recommendations are shown in the appendix.

(5) Facilities to be provided on loading and unloading berths :

Crane and godown facilities should be provided.

(6) Development of industries and trade centres along canal bank.

A more appropriate way to deal with this aspect would be to form a Board consisting of representatives of the D.V.C., the West Bengal State Government and the Central Government. This Board should decide on the industrial sites alongside the canal banks, which should be developed and earmarked for establishment of large-scale, medium-scale and small-scale industries in future.

(7) Studying of the problem of coal movement :

The members understood from Shri D. Mookerjee, Dy. Chief Engineer, D.V.C., that the Coal Commissioner had already taken up this matter. This item should, therefore be deleted from the terms of reference of the Sub-Committee.

Location of Loading/Unloading Berths

Recommendations of the Traffic Promotion Sub-Committee.

Suggested Location.	Traffic. (2)	Bank. (3)	Location. (4)	Remarks : (5)
1. Rajbundh	Bulk of the traffic expected, will be agricultural products from the right bank.	Right Bank	At a suitable distance away from the downstream nose of the exit channel of the lock at Ch. 324.	—
2. Panagarh	Agricultural products.	Left Bank	At a suitable distance away from the downstream nose of the exit channel of the lock at Ch. 540.	
3. Paraj	—	Left Bank	At a suitable distance away from the downstream nose of the exit Channel of the lock at Ch. 1193.	
*4. Galsi	Traffic will be agricultural products from the market on the right-hand side of the canal.	Right Bank	At a suitable distance away from the nose of the approach channel of the lock.	(1) The existing road connecting to G. T. Road is much too circuitous and should be replaced by a straight road. Length of such a road will be less than a mile. (2) Suitable area on the left bank should also be ear-marked for traffic of agricultural products which can be expected from Galsi side.

(1)	(2)	(3)	(4)	(5)
5. Sadarghat	—	Left Bank	As proposed by S.E. (B & C) D.V.C.—At the crossing of the exit road to Sadarghat with L.B.M.C.	—
6. Borsul	—	Left Bank	At a suitable distance away from the nose of the approach channel.	Construction to pend till the industries in the area develop, when a road link, approximately 1/4 mile, will have to be provided for.
7. Memari-Chakdighi Road Crossing	—	—	—	This is not considered necessary in view of one loading/unloading berth at the G. T. Road crossing.
*8. G. T. Road Crossing	—	Left Bank	As proposed by S.E. (B & C) D.V.C.—100' on the south of the G. T. Road.	The existing portion of Dhusi rendered defunct, may be profitably utilised as a creek and for parking idle barges.
9. Boinchee	—	Right Bank	A suitable site as near as possible on the downstream side of the lock.	The suitability of converting the line of the borrow pits adjacent to the road embankment into a creek for loading and unloading purpose should be explored.
10. Pandua	—	Right Bank	As proposed by S.E. (B & C) at a suitable distance on the downstream side of the road bridge.	—

Note : (1) Mogra and Nityanandapur :—There is no link road upto Mogra and Nityanandapur. Construction of loading and unloading berths at these sites is not considered so urgent.

(2) Adequate provision should be kept for erection of godowns, installation of cranes etc. for the future.

(3) Locations marked with*—These are to be given priority over the other sites.

B. Sub-Committee on "Boating Organisation and Canal Navigation."

Convener :

**Sri A. L. Das, I.S.E.,
Addl. Chief Engineer,
Damodar Valley Corporation.**

Members :

- (1) **Sri J. C. Chacko,
Secretary, G.B.W.T. Board.**
- (2) **Capt. T. B. Bose, I.N.,
Principal Officer,
Mercantile Marine Deptt.**
- (3) **Sri I. B. De, Chief Engineer,
Irrigation and Waterways Directorate,
Government of West Bengal.**

As Sri A. L. Das left D.V.C., Sri D. Mookerjee, Deputy Chief Engineer, D.V.C., succeeded him as convener.

Terms of reference :

- (a) Determination of nature of organisation.
- (b) Determination of suitable type of boats and towage with reference to permissible speed in canal and soil condition.
- (c) Framing Navigation Rules and Regulation.
- (d) Fixation of canal dues.
- (e) Authority for controlling Navigation inside the canal and arrangement for enforcement of Rules and Regulations.

Recommendations of Sub-Committee on "Boating Organisation and Canal Navigation" of D.V.C. Navigation Advisory Committee.

1. Determination of Nature of Organisation :

The Sub-Committee felt that the Canal should not be left to any monopoly concern for carrying out the transport business, neither would it be desirable to run under the direct management of the D.V.C.

The Sub-Committee therefore recommends that the promotion of traffic and the actual transport operation should be managed by setting up of a Water Transport Development Corporation in which the Government of West Bengal, D.V.C., and the Private Sector would have due shares.

2. Determination of suitable type of boats and towage with reference to permissible speed in canal and soil condition :

- (a) Type of boats and the numbers required commoditywise should be determined by the proposed Development Corporation according to their needs.

- (b) A certain proportion of country boats may be allowed on special licenses to ply inside the canal, the number of which will be determined according to the exigencies of circumstances.
- (c) The construction details of the barges may be determined by the proposed Development Corporation in keeping with the sizes of the Lock Chamber. The Locks have been designed for maximum size of barges as shown below :

Length Overall 100'	Self propelled—130'
Breadth Overall 16' to 17'—0"	
Draft—6'	

Two such barges along with a tug can be accommodated in the Lock Chamber. When fully loaded, the maximum load is 280 tons each.

- (d) Methods of Propulsion :

The following methods of propulsion are recommended

- (i) Self propelled barges
- (ii) Towing : Pulled or pushed.

The findings of the experiments now being carried out by Ganga Brahmaputra Water Transport Board may be helpful in determining the suitable method of towing.

(iii) The maximum speed of the vessels that the canal banks can safely bear without erosion is about 4/5 knots. The canal is not proposed to be lined at present excepting some specific stretches where soil condition requires such lining.

3. Framing Rules & Regulations :

(A set of rules will be furnished by Sri Mazumdar by 28th inst. This will have to be finalised by the D.V.C. in consultation with the proposed Development Corporation.)

4. Fixation of Canal Dues :

The Canal dues including wharfage and other charges should be fixed by the proposed Development Corporation in consultation with D.V.C.

5. Authority for controlling navigation inside the canal and arrangement for enforcement of Rules & Regulations :

- (i) D.V.C. will control navigation inside the canal in consultation with the proposed Development Corporation.
- (ii) So far as the enforcement of Rules & Regulations are concerned, enactment of legislation is perhaps necessary unless navigation inside the canal can be brought within the scope of any of the Acts Controlling I.W.T.

C. "Conservancy and Harbour Development" Sub-Committee.

Convenor :

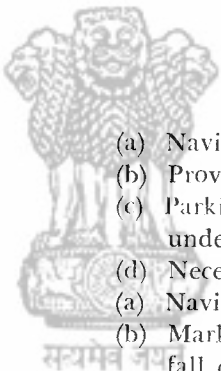
Sri A. L. Das, I.S.E.,
Addl. Chief Engineer,
Damodar Valley Corporation.

Member :

- (1) Sri L. M. Hogan,
Traffic Manager,
Calcutta Port Commissioners.
- (2) Sri P. S. Vanchiswar, Nautical Surveyor,
M.M.D. Representing Capt. T. B. Bose,
I.N.
- (3) Sri S. L. Sarathy,
Representing Dy. Conservator, Calcutta
Port Commissioners.
- (4) Sri J. M. Majumdar,
Navigation Adviser,
Damodar Valley Corporation—on invitation

As Sri A. L. Das left D.V.C., Sri D. Mookerjee, Dy. Chief Engineer, D.V.C. succeeded him as convenor.

Terms of references :

- 
- (i)
 - (a) Navigation problems in Canal.
 - (b) Provision for towing vessels.
 - (c) Parking places for idle boats on beach undergoing repairs.
 - (d) Necessity for lining canal.
 - (ii)
 - (a) Navigation problem in Hooghly.
 - (b) Marking of Navigation channel from outfall of Kunti upto near Howrah bridge.
 - (iii) Planning in land harbour at Durgapur.
 - (iv) Provision of facilities at Calcutta Port for loading and unloading.
- (1) Navigation Problems in Canal : Provision for towing vessels : Parking places for idle boats on beach undergoing repair : Necessity for lining canal.

Recommendations of the Sub-Committee :

(a) Maintenance of Channels & future problems :

For quick development of traffic and efficient use of the Canal, careful maintenance will be necessary. The outfall of Kunti would require proper attention and periodical dredging may have to be resorted to.

To avoid difficulty in getting additional land for construction of further locks, the Sub-Committee feels that either acquisition of additional land may be immediately arranged or sale of land along side the canal may be controlled in consultation with the Government of West Bengal.

(b) Necessity for lining of the Canals :

At present the Canal is not proposed to be lined except in any specific stretch where the soil condition requires such lining.

(c) Parking places for idle boats on beach undergoing repairs :

Forty feet width of berm which has been provided is considered sufficient for the purpose of repairing vessels. Parking places for idle boats undergoing repairs would require sufficient space.

Two or three suitable places near Memari where there are low grounds, or portions of tanks left out, contiguous to the navigation canal, and the heads of off-taking canals now abandoned, such as Gangur, may be conveniently utilised for that purpose.

(2) Navigation problem in Hooghly : Marking of Navigation channel from outfall of Kunti upto near Howrah Bridge.

Recommendations of the Sub-Committee :

(a) There are three principal bars between Calcutta and outfall of the Kunti into the Hooghly which restrict Navigation.

(i) Barrackpore Bar : While a minimum depth of 6' is generally available a depth of 3' 6" has been recorded after this year's freshets. There are transits to define the navigation channel.

(ii) Chinsurah Bar : Downstream of Jubilee Bridge. This is troublesome and after this year's freshets, the minimum depth recorded is 2 ft.

(iii) Halisahar Bar : A depth of 2' to 3' is generally available at low water and is the worst link of the chain of the bars. The result of this year's survey is awaited to show the position after this year's freshets.

(b) Between end of June and beginning of December unrestricted navigation at all states of tide is available. Between middle of December and June the navigation will have to be restricted to the flood or rising tide and on the ebb to half tide only with the exception of few days during the nip tides in February and March when navigation will have to be confined to about the time of high water only.

(c) Navigational aids :

(i) Periodical hydrographical surveys will be carried out by C.P.C. and transit marks will be set up by them to define the deepest channel over the bars. Facilities are to be provided for day navigation only.

(ii) Tide tables indicating predictions of daily high and low water, trends and height will be made available for Garden Reach (Calcutta) by C.P.C. wherefrom the corresponding levels at Bansberia can be computed by adding about 2 hours 45 minutes.

(3) Planning inland harbour at Durgapur :

Recommendations of the Sub-Committee—

- (a) (i) On account of the setting up of different industries at Durgapur, the space available for constructing the terminal harbour is limited, and it is therefore recommended to provide loading and unloading berths enroute as well.

Installation of Cranes and similar other appliances may await further development to determine the exact needs.

- (ii) For providing sufficient space for Parking vessels undergoing repair, extra land will be necessary. Loading and unloading berths may partly serve the need but as an advance precautionary measure, Government of West Bengal should be requested to consult D.V.C. before they dispose of any land upto 500 ft. from the Navigation Canal bank so that any unwanted growth of structures etc. may be prevented.

- (iii) Oil installation should be located as far remote as possible to ensure safety of the Port.

- (iv) To cope for the present need no installation at Durgapur is necessary unless the Steel Project demand any ancillary works for transport of steel. This can be steadily developed as and when the need arises.

(4) Provision of facilities at Calcutta Port for loading and unloading :

Calcutta Port is already handling the nature of traffic expected from Navigation Canal and upto a foreseeable future, no further development is considered necessary.

On future and extensive development of traffic the question of provision of further facilities may be taken up considering the type of cargo, and the arrangement of its disposal.

सत्यमेव जयते

D. Coal Sub-Committee

Convenor :

Sri J. M. Mazumdar,
Navigation Adviser, D.V.C.

Members :

- (1) Sri A. B. Ganguli, I.C.S.,
Member, D.V.C.
- (2) Sri S. M. Banerjee, I.A. & A.S.,
Financial Adviser, D.V.C.
- (3) Sri R. S. Bhattacharjee,
Movement Sponsoring Authority and
Principal Liaison Officer,
Government of West Bengal.

Terms of Reference :

- (1) Studying the problem of Coal Movement.
- (2) Transport of Coal by Canal Route.

Both of the above problems were hinged over the question of bringing coal to the canal terminus from the pitheads. The only means feasible was considered to be the installation of an aerial ropeway, which would carry coal to the canal terminus, and on its return journey, would carry sand from Damodar for sand stowing purposes.

As this very proposition is being dealt with in detail by the Chief Mining Engineer, Government of India and the Coal Board, no separate study has been considered necessary.

E. The Sub-Committee for "Determination of the shape and sizes of Barges and Tugs."

Members :

1. Sri P.S., Vanchiswar,
Nautical Surveyor,
Representing Mercantile Marine Deptt.
2. Sri K. Parthasarathy,
Senior Engineer & Ship Surveyor,
Representing Mercantile Marine Deptt.
3. Sri P. N. Batra,
Assistant Conservator,
Calcutta Port Commissioners.
4. Sri D. Mookerjee,
Deputy Chief Engineer,
Damodar Valley Corporation.



Terms of references :

- (a) To determine the suitable shape and size of barges and tugs for introduction into the D.V.C. Navigation Canal with reference to the standard and conventional types.
- (b) Feasibility of the method of towing two barges at a time.
- (c) Determination of the maximum number of empty barges that could be towed during return journey, without serious detriment to the canal banks.
- (d) Examination of the Draft Rules prepared by the Navigation Adviser.

Proceedings of the first and concluding meeting of the Sub-Committee for "Determination of the shape and sizes of Barges and Tugs" of the Damodar Valley Corporation Navigation Advisory Committee held on 28-5-57 at 10-30 A.M. in the room of Shri D. Mookerjee, Deputy Chief Engineer, Damodar Valley Corporation, at Anderson House, Alipore.

1. The letter received from M/s. Mazagon Dock Ltd. in reply to our query regarding the standard and conventional size of barges and tugs to suit the requirements of the D.V.C. Navigation Canal as had been manufactured by them, was discussed. It was learnt from the

above reply that there would be no difficulty in the manufacture of the barges and tugs of limiting dimensions assumed in the Financial Prospects prepared by Sri D. Mookerjea, and based on this information the Sub-Committee upheld the above assumption so far as the provisional shapes and sizes were concerned.

2. Sri Batra referred to the Financial Prospects prepared by Sri D. Mookerjea and pointed out that the carrying capacity of the barges assumed as 200 tons, compared with the gross displacement of 284 tons may be rechecked. Taking into account the streamlined shape of the craft the actual displacement is generally taken as 0.85/.90 times the gross figure, and, deducting from this the dead weight of the vessel, the net carrying capacity may be checked up.

3. A close determination of the initial cost of the barges & tugs presented a rather difficult problem. Sri D. Mookerjea informed the Sub-Committee that several local firms were addressed to indicate the cost, upon which all other firms declined excepting M/s. Mazagon Dock Ltd. Available sources however indicated widely varying rates. M. J. J. Suric, in his report of 1954, assumed the cost of 200 tons barges @ Rs. 44,000/- each and that for 180 BHP tug @ Rs. 2,40,000/- each. Similar figures were suggested by the expert working group of the ECAFE also, reported in 1954. Present rates indicated by M/s. Mazagon Dock Ltd. as Rs. 2,25,000/- for each 200 tons barge and Rs. 4,00,000/- each for 150 BHP tug were, however, considered much on the higher side. Under the circumstances the Sub-Committee felt that (a) the Hindusthan Ship Yard and (b) M/s. Shalimar Works be requested to indicate the cost of barges and tugs required by us and M/s. Hooghly Docking Ltd. and Garden Reach Workshop be again approached to indicate only the approximate cost of the vessels of near about sizes. Sri Parthasarathy intimated that the rates offered by M/s. India General Navigation and Railway Co. Ltd., with whom the manufacture of barges and tugs were entrusted by the G.B.W.T. Board, were with him, and that he would make these available to the Sub-Committee.

4. In the opinion of the Sub-Committee the assumption of towing two barges in the downward traffic should be adhered to, while in the upward journey, to begin with, four barges may be tugged to one tow boat, and this number could be suitably altered on the basis of the experience gained at a later date. ,

A provision of 5% extra barges and tugs upto 1971-72 was also suggested by the Sub-Committee.

5. The Representatives of the Port Commissioners and Mercantile Marine Department, in the absence of sufficient statistical information on the subject expressed their inability in suggesting suitable percentage charges on maintenance and overhead. It was desired that local shipping establishments e.g. I.G.N.R. etc. may be approached to indicate suitable figures.

6. The draft rules prepared by Sri Mazumdar were discussed. It was suggested by the Officers of the MMD that Sri Majumdar be requested to get in touch with them and redraft the rules with particular reference to navigation inside the canal and keeping in conformity with the Calcutta Port Rules & Indian Steam Vessels Act.

The following points were however noted –

- (a) One set of the crew was considered to be enough to man the vessels with some over-time allowance only. This was said to be the practice of the Port Commissioners also (considering no night Navigation).
- (b) The crew shown against each category of the flats or cargo boats in the Draft rules were now backdated and the rules invogue now should only be stipulated.
- (c) Mention should be made in the rules that upward traffic should have priority over the downward traffic in the matter of crossings.
- (d) Rules should stipulate indemnification D.V.C. against losses.
- (e) Government of West Bengal should be approached for their ruling to authorise the MMD in order that they exercise their rights of activity in the D.V.C. Navigation Canal.
- (f) Some salvage equipments should be maintained by the D.V.C. and the concerning parties charged suitably when occasion would arise. Mention of this should also find place in the rules.

F. The Sub-Committee for “The Examination of the freight structure.”

Members :

- (1) Sri R. S. Bhattacharjee,
Movement Sponsoring Authority &
Principal Liaison Officer,
Government of West Bengal.
- (2) Sri M. M. Sinha,
Divisional Commercial Superintendent (Rates).
E. Rly. Representing Railways.
- (3) Sri D. Mookerjee,
Deputy Chief Engineer,
Damodar Valley Corporation.

Terms of references :

- (a) To examine the freight structure, assumed in the “Financial Prospects of the Damodar Hooghly Navigation Canal” prepared by Sri D. Mookerjee.

Proceedings of the first and concluding meeting of the Sub-Committee for Examination of the freight structure of the D.V.C. Navigation Advisory Committee, held on 27-5-57 at 10-30 A.M. in the room of Sri D. Mookerjee at Anderson House.

1. Attention of the Officer representing the railways was drawn to the letter written on the 4th February, 1957 addressed to the General Manager by the Corporation, requesting the railways to furnish the freight rates, terminal charges, etc. as per proforma enclosed therein, to which no reply had yet been received.

Sri Sinha promised to look into the matter and to expedite furnishing the information.

2. Requirements of barges and tugs based on the commoditywise traffic was then discussed and Sri Bhattacharjee suggested that, in order to cater for the periodic overhauls of the crafts, the total numbers thereof as have been calculated for each year should be increased by 5% up to 1971-72. The increased provision of 10% which has been made after 1971-72 was considered sufficient.

3. The projected growth of traffic commodity-wise as has been assumed in the Financial Prospect of the "Damodar-Hooghly Navigation Canal" prepared by Sri D. Mookerjee, was then discussed at full length. In some cases, particularly, in respect of coal downward, paddy downward, construction material downward, some of the members felt that the provisions were not in proper conformity. The position was explained in full details by Sri D. Mookerjee, but it was still felt by Sri Sinha, Divisional Commercial Superintendent (Rates) representing the Chief Commercial Superintendent, Eastern Railway, that the estimate of traffic needed a detailed check by further investigation. The assumption of traffic for coal is however dependent on the successful implementation of aerial ropeway scheme. Not much of progress, however, could have been achieved as the freight rates and other charges that were asked for from the railways as stated above, were not in hand. The member representing the Railways, however, promised to furnish the information, as early as possible.



APPENDIX III.

**DAMODAR VALLEY CORPORATION.
FINANCIAL ANALYSIS & FORECAST OF
THE D.V.C. NAVIGATION CANAL
OPERATION SCHEME.**

**D. MOOKERJEA, S.S.E., M.I.E.
DEPUTY CHIEF ENGINEER
DAMODAR VALLEY CORPORATION.**





सत्यमेव जयते

DAMODAR VALLEY CORPORATION.

FINANCIAL PROSPECTS OF DAMODAR-HOOGHLY NAVIGATION CANAL.

1. The Navigation Canal with the Salient features :

1.1. The left bank main canal of the irrigation system in the Damodar Valley Project has been designed as Irrigation-cum-Navigation Canal. The canal takes off from the Headworks at Durgapur and meets the river Kunti about a mile above its outfall into the Hooghly near Tribeni. As this is primarily an Irrigation Project, the main purpose of the canal will be to serve the irrigation needs but advantage has been taken to utilise the canal for the purpose of Navigation also by addition of some ancilliary works without incurring heavy capital outlay.

1.2. The bed width of the canal varies from 172' at the head to 60' at the tail end. It is proposed to maintain a clear depth of water upto 12' during the Kharif season (June-November) but during the rest of the year owing to reduced demand for irrigation and corresponding low discharge in the canal a minimum depth of water upto 8' will be maintained. The clear headroom under the bridges over the maximum water level in the canal will be 17'. In fact, for the purposes of design, we are providing for a minimum 9' depth of water with an allowance of 1 foot for siltation. This will enable crafts and barges upto 6' draft to ply in the canal throughout the year without any difficulty. As the Canal during the winter and summer will be carrying reduced discharge with a much flatter slope it is absolutely essential to locate cross regulators (and consequently locks) at closer intervals to maintain draft of 8' in the canal. As this cannot be avoided in the interest of a minimum depth of water, the navigation system has been designed to fit in with certain obligatory arrangement. It may be pointed out that the main purpose for which the canal has been planned is for irrigation. The design of the locks has been made to serve the requirements of two 200/250 ton capacity barges, so that in one operation two barges can be taken from the upstream to the downstream and vice-versa. The maximum velocity in the head reach of the canal when it will carry full discharge will be of the order of 4' per sec.; but such condition will not prevail for a period more than 20 to 25 days in a year. In most of the period the velocity will be varying from 2' to 3'—sec. Under no circumstances vessels will be permitted to exceed a speed of 5 knots over the ground, as the canal banks are liable to be affected by wave action and shore-wash. Incidentally, in our present plan we are not providing any lining anywhere and this will be purely an earthen channel with the side slope as two horizontal to one vertical. The clear inside dimension of the lock chambers is 286' in length by 20' in width. The gates controlling the lock chambers are of Mitre Type Steel Gates.

1.3. The D.V.C. Navigation Canal runs more or less parallel to the G. T. Road, being within even less than a mile in most of the reach. Provision of loading and unloading berths at suitable important station such as, Rajbandh, Panagarh, Paraj, Galsi, Sadarghat, Borsul, Memari, Boinchee, Pandua and Mogra, is being made. For the purpose of easy transport upto the loading and unloading points, the question of improvement of the existing link roads of building new ones where necessary is being taken up with the State Government. The intermediate loading and unloading stations will be provided with godowns and sufficient space for movements. Provision of cranes and other equipments as well, as will be found necessary

will be made. As upto this stage, it is too early to make any definite provision for the terminal facilities at Durgapur, these are being planned to be taken up considering the nature, growth and development of the traffic.

1.4. So far the questions of handling the super-imposed traffic load at the Calcutta Port is concerned, it has been gathered from the Port authorities that, upto the foreseeable future there would be no difficulty of handling this with their existing arrangements. On further demand of course, the Port authorities will surely make suitable arrangements as would be found necessary.

2. Traffic Potentiality of the Scheme :

2.1. Though difficult to present a precise volume of traffic in the area, as has been upto the recent past, an attempt is made to show the approximate figure as indicated below :

- (a) Annual traffic handled by Railways
between Durgapur and Calcutta. = 4 Million Ton.
- (b) Annual coal traffic from Raniganj and
neighbouring coal fields towards
Calcutta. = 3.2 do.
- (c) Annual traffic by G. T. Road
excluding coal below Durgapur.
(This is gradually on the increase). = 60,000 Tons.
- (d) Annual high rated traffic
below Durgapur from
Asansol area. = 8,00,000 Tons.
- (e) Annual Bunker Coal traffic handled by
Railways below Durgapur. = 1 Million Tons.

2.2. Out of the present rate of raising of nearly 6 million tons of coal annually from the Ondal Fields, nearly 30% is sent in the downward traffic towards Calcutta. The second and the third Five Year Plans envisage an increase in the production of coal to 60 million tons and to 150 million tons respectively. A Substantial proportion of these targets is attributed to the Ondal Coal Fields as well. Recent explorations have indicated presence of coal seams rather close to Durgapur area. The Steel Works at Durgapur will be producing 3½ lakhs tons Pig Iron and the West Bengal Durgapur Coke-Oven Plant will produce, by the end of 1958, nearly 3 lakhs tons of Coke suitable for Industrial use. Factories under Private Sector licensed at Durgapur include two refractories with a total annual manufacturing capacity of 40,000 tons, two slag cement factories with an aggregate production capacity of 2,40,000 tons, two structural units together producing 26,000 tons, cement Factory with an estimated output of 30,000 tons and a 3,60,000 ton Sugar Factory. The existence of the Navigation Canal has attracted the attention of the Private Sector in establishing a large scale boiler manufacturing industry in this area. The prospect of the transport of granite stone from Bankura area and Damodar Sand at competitive rates for construction purposes also appears to be very significant. This alone will mean an annual traffic of 5,00,000 tons on a very modest estimate.

2.3. Besides these, agricultural products in the downward and jute bags, oils, oil products, part of imported cement and asphalt, heavy industrial machinery, consumer goods for the large townships in that area etc. in the upward direction will contribute a significant traffic.

2.4. It is highly incorrect to assume that water transport competes with the rail transport. There is a natural division of traffic between the two; one supplements the other. The very idea of locating so many large scale Industries in the Durgapur area and consequent development of subsidiary Industries would more than support that the development of Navigable water ways, instead of taking away any traffic, has brought fresh traffic to the Railways.

2.5. The total annual traffic in the D.V.C. Canal is for the present assumed as 2 million tons. Taking into consideration of the relative merits and demerits of suitability, transport charges, quickness in service etc. as compared with other means of transport, the D.V.C. Navigation Canal reasonably can claim according to a recent survey a share of traffic as indicated hereunder :

(a) Coal	...	...	...	...	10,00,000	Ton/Year.
(b) Agricultural products	...	...	...	...	5,00,000	do.
(c) Construction materials such as sand, gravels etc.	...	...	...	...	2,00,000	do.
(d) Colliery Stores	...	...	...	...	50,000	do.
(e) Industrial Products	...	...	...	...	2,00,000	do.
(f) Inter-canal transport	...	...	...	...	50,000	do.
					<hr/>	
					Total	20,00,000 Ton/Year.
					<hr/>	

Apart from these, a considerable traffic of POL, Acids, and other high rated materials is also expected.

3. Proposed transport facilities :

3.1. Now coming to the question of capacity of the canal to handle the traffic, the following figures would be interesting :

(i) Size of Barges :

The size of barge assumed is 100' × 17' which will ply in the Navigation Canal with a draft of 6'.

The displacement volume = $110 \times 17 \times 6$ cft.

The gross load that such a barge can carry
 assuming a block co-efficient of 0.9 = $\frac{0.9 \times 100 \times 17 \times 62.5 \times 6}{2240}$ tons.
 = 256 Tons.

Such a barge can be safely assumed to carry a super imposed load of 200 tons allowing for space occupied by structural consideration and other factors.

(ii) Lock Performance :

The time of locking i.e. the time required to enter the lock and exit from the lock according to a very pessimistic estimate will be as per following break up :

Time required at the approach channel	...	...	10 minutes
Time required at the exit channel	...	...	8 minutes
Time of filling and/or emptying the lock	...	...	12 minutes
			<hr/>
			30 minutes

with the arrangements proposed and with the development in the water-transport in the country it can be very reasonably expected that the actual time in practice will be half or less than half of the above figure.

3.2. As the lock will allow two barges at a time, it will handle 400/30 or 13.3 tons per minute. At this rate the annual traffic that a lock can handle, assuming 300 working days in a year and 16 hours working period per day, half of which is taken up by loaded downstream traffic and half, by empty upstream traffic is—

$$(400/30 \times 60 \times 16 \times 300) \frac{1}{2}$$

$$= 19,20,000 \text{ Tons.}$$

3.3. Here it is being assumed that the entire upstream traffic will travel empty. This will never be the case in actual practice. It can safely be anticipated that the upstream traffic will carry considerable upland traffic specially machineries, oil fuels, petroleum, scrap iron and consumer goods which will add to the total volume of annual traffic handled by the canal. Then again the canal will run throughout the year every day and not 300 days as assumed. The locks can also be worked in 3 shifts in which case it can be very reasonably expected that the present arrangement shall be able to handle a traffic upto 4 million tons without undue strain on the system.

3.4. Average Turn Round :

In order to have an idea of the total number of cargo vessels required for carrying the anticipated volume of traffic the average turnround time is required to be known. The minimum time required as assumed by Dr. West-Phal an expert in this field is—

16 hours for loading
21 hours for travelling in the canal
11 hours for lying in the locks
8 hours for Hooghly Journey
32 hours for unloading
35 hours for empty return journey
5 hours for waiting time.
<hr/>
128 hours total.

This means eight, with Sundays, nine days' turn round time.

3.5. It will be seen that in arriving at the timing the above represent not only a most conservative estimate but a very pessimistic picture has been put up. With the increase in traffic intensity it would be easily possible to reduce the time of operating the locks by 50% since the present design already provides for such improvements. Moreover, as the canal is running close to the D.V.C. Transmission System as well as Electrified Railways System, the canal can, without any difficulty whatsoever, be operated 24 hours instead of 16 hours as assumed and the operation of locks can also be made electrically instead of by the age old manual operation thus reducing the time involved for the movement of traffic in the Navigation Canal.

3.6. There has been some apprehension about the size of locks provided in the D.V.C. Canal. It may be interesting to record that except for the inland water transport system in USA rivers and Rhine and Rhone Canal System in Germany in the majority of inland canals in the continent the size of the locks is even smaller than what has been provided in the D.V.C. Canal System.

3.7. The width of the locks located on the St. Martin Canal (On Seine River in France) is 5.2 m. i.e. 17.3' for a barge of width equal to 5 m. i.e. 15.65'. Again, the locks located on the Lahu River (Canalised) are 5.55 m. i.e. 17.38' wide in order to accommodate barges of width 5.15 m. i.e. 17.15'. As against these the lock width in the left bank navigation canal of D.V.C. is 20' while the barge is proposed to be 17' wide. Thus the proposed width of the D.V.C. locks will be quite sufficient judged by the above standards. It is true that the large sized locks provide wider flexibility in the size of barges and tugs and consequently are more advantageous from the point of view of Navigation but the cost factor which would be unduly high cannot certainly be overlooked. It should be recommended that this canal is primarily meant to cater for inland and at the most coastal traffic. The size of dumb barges at present operated by the inland water transport companies in Calcutta area will also fit in with the size of locks provided in this canal.

4. Comparison of Freight Road, Rail and Water :

4.1. So far as the freight charges are concerned, the following rates of Eastern Railways will be interesting :

1. Coal & Coke :

From Raniganj to Kidderpore Dock (113 miles)
Rs.—6/10/- per ton.

In addition, the following are also charged for separately.

- (i) Haulage charge of -/13/8 per ton.
- (ii) Supplementary charges of /1/- per rupee of total freight.
- (iii) Labour charge of -/12/2½ per ton of coal and -/15/2½ per ton of Hard Coke.
- (iv) Including these, the freight works at Rs. -/1/2½ pies per ton mile.

2. Sand :

Kidderpore Dock—Durgapur

Port Commission Haulage charge	...	...	Rs. -/6/- per mdl.
Special charge (Eastern Rly.)	...	...	-/2/10 ..
Terminal ..	...	...	-/1/- ..
Howrah Bridge tax (H.B.T.)	...	...	-/2/- ..

-/4/6 per mdl.

3. Iron or Steel Divn. 3 : K.P. Dock—Durgapur		
Subject to the packing do. CPC/H	...	... -/-/6 per md.
Condition as laid down in the E	...	... -/5/3 ..
I.R.C.A.'s goods traffic terminal	...	... -/1/- ..
No. 29 of 1954 H.B. Tax	...	... -/-/2 ..
		<hr/> -/6/11 ..
4. Paddy : K.P. Dock C.P.C./HC		
E	...	... -/-/6 per md.
Ter	...	... -/3/2 ..
HBT	...	... -/1/- ..
		<hr/> -/-/2 ..
		<hr/> -/4/10 per md.
5. Machinery other than —do.— C.P.C./HC		
E	...	... -/-/6 per md.
Ter	...	... -/5/8 ..
HBT	...	... -/1/4 ..
		<hr/> -/-/2 ..
		<hr/> -/7/8 per md.

[Note : An extra charge of two pies per md. will be levied and recovered locally by the C.P.C. Rly's staff if the consignments are loaded or unloaded by them at Kidderpore Dock.

This rate is applicable both in wagon loads and in smalls.

In the case of booking of smalls, weighing less than 20 mds. a surcharge of $6\frac{1}{4}\%$ on freight will be levied. A supplementary charge of one anna per rupee on the total will be levied except on the rate of paddy.]

The rate on other commodities (paddy) work out to Rs. $1\frac{1}{2}$ /- per ton mile.

In the case of roads transport over the Grand Trunk Road, the freight now charged is about -/4/- to -/6/- per ton mile.

The freight rate of I.W.T. from Calcutta to Assam is between 1 and $1\frac{1}{2}$ as. for other goods and 1.68 as. for tea per ton mile.

4.2. While it is a fact that Inland water-transport has a set-back compared to other means of transport in the matter of route, which is round about particularly as in the case between Calcutta and Assam, the D.V.C. Navigation Canal suffers least from this handicap, and therefore the relative advantage in presenting a competitive freight structure is obvious.

5. Proposed Freight Rates :

For purposes of a financial analysis the freight rate in the D.V.C. Canal has been assumed as -/-/10 pies and -/1/- anna per ton mile for coal and other commodities respectively.

With this freight structure, the anticipated financial return has been worked out as may be seen in the Statements VII & VIII. Statement VII shows the percentage of profit excluding the interest on the Capital expenses, while in the Statement VIII the interest has been shown as capitalised, and the percentage return worked out accordingly. The latter is the procedure adopted in preparing the financial forecasts in all Government Projects. Referring to Statement VIII it will be seen that the anticipated annual return from the cumulative investment, accumulating to Rs. 4,34,94,000 at the end of 1971-72 is 6.7% exclusive of the D.V.C. tollage charge of Rs. 30,00,000/- and all other charges.

5.2. The assumptions made in preparing this forecast may be seen in the explanatory notes attached to the various Statements.

5.3. With the further growth of traffic, an additional lock can be easily located alongside the existing ones to cope with the increased traffic in which case the return on the investment will be more attractive even allowing for further capital outlay.

5.4. The freight charges assumed for the D.V.C. Navigation Canal are not at all high, as can be seen from the following table, even considering the different routes and mileages involved for the other modes of transport.

Mode of Transport.	Type of commodity	Raniguni/Durgapur to Calcutta mileage.	Total freight charges per ton.
Railways	Coal	Rng. 113 miles	Rs. 8/9/9½
Road		Dgp. 114 miles	Rs. 32/-
D.V.C. Canal		Dgp. 120 miles	Rs. 6/4/-
Railway	Paddy	Dgp. 98 miles	Rs. 8/3/-
Road		Dgp. 114 miles	Rs. 32/-
D.V.C. Canal		Dgp. 120 miles	Rs. 7/8/-

5.5. The main problem in regard to the major traffic viz. coal is to arrange for its transport from the pit head to the canal head. It is intended to instal aerial ropeway to get this traffic. The capital expenditure involved in this arrangement is expected to be within Rupees three to four lakhs per mile. In the present case the average distance from the Ondal Coal fields to Durgapur is of the order of 10/12 miles. The capital outlay involved is therefore of the order of Rs. 35 lakhs.

5.6. The haulage charge in the case of aerial ropeway is nearly 12 pies per ton mile. The additional revenue to be realised for this distance will more than justify installation of aerial ropeways from the pit head to the canal head. If in addition these tubs can be made to take sand in the return trip for stowing, this will bring additional revenue to the project.

5.7. Considering all these factors, and as may be seen from the enclosed analysis, the prospect of the Navigation scheme appears not only sound but rather attractive. The success of course is largely dependent on the proper operation of the system under a well balanced organisation.

Sd/- D. Mookerjee.
Deputy Chief Engineer
B. & I., D.V.C.

Explanatory Note on Statement IV**Details of Working Expenditure**

(Pay of Khalasi, crew, etc.)

Assumption :

(i) Requirement of crew for each Barge :	
Majhi 1 No. each @ Rs. 80/- including allowances	= Rs. 80/- p.m.
Dandees 5 Nos. each @ Rs. 55/- including allowances	= Rs. 275/- p.m.
	<hr/>
Total Rs.	355/- p.m.
Extra for allowances for overtime @ 5%	Rs. 18/- p.m.
	<hr/>
Grand Total Rs.	373/- p.m.
	or Rs. 4475/- per annum.

(ii) Requirement of crew for each tug.	
Serang (3rd class) 1 No. each @ Rs. 137/- p.m. (including allowance)	= Rs. 137/- p.m.
Sukanis 2 Nos. each @ Rs. 80/- p.m. (including allowance)	= Rs. 160/- p.m.
Lascars 4 Nos. each @ Rs. 64/- p.m. (including allowance)	= Rs. 256/- p.m.
Bhandari 1 No. each @ Rs. 64/- p.m. (including allowance)	= Rs. 64/- p.m.
Driver 1 No. each @ Rs. 150/- p.m. (including allowance)	= Rs. 150/- p.m.
Tindel 1 No. each @ Rs. 85/- p.m. (including allowance)	= Rs. 85/- p.m.
Greaser 1 No. each @ Rs. 74/- p.m. (including allowance)	= Rs. 74/- p.m.
	<hr/>
Total Rs.	926/- p.m.
	or Rs. 11,112/- annually.
Extra allowances for over-time @ 5%	= Rs. 556/-
	<hr/>
Grand Total Rs.	11,668/- annually.
	<hr/>
Say Rs.	11,700/- annually.
	<hr/>

EXPLANATORY NOTE ON STATEMENT V.

Initial costs of barges and tugs, as have been available from different sources, are shown in the following chart :

	Source of information.	Barges.		Tugs.	
		Cost of each.	Tonage.	Cost of each.	B.H.P.
1.	M/s. Mazagon Dock Ltd. Bombay	2,25,000	200	4,00,000	150
2.	M/s. Garden Reach Workshop Ltd., Calcutta	1,50,000	200	2,50,000	150
3.	M/s. Hooghly Docking & Engineering Works Ltd., Calcutta	1,40,000	200	1,30,000 10,20,000	80 500
4.	M/s. Indo Swiss Trading Co. Ltd., Calcutta	1,00,000 60,000 35,000	200 100 50	2,00,000 3,00,000 4,00,000	150 350 500
5.	Hindusthan Shipyards, Visakhapatam. ... ..	... Rates were not to our requirement.			
6.	M/s. I G. N. R. Co. Ltd.'s rates for Crafts of G.B.W.T. Boad	80,500 & 95,500	150	79,053 & 5,38,000	100 300

Note : M/s. Hooghly Docking & Engineering Works Ltd. and others indicated that there would be a substantial reduction in the initial costs, if orders are placed in a lot for a number of vessels of similar type.

It will be seen from the above that the rates are widely varying, and the range of rates indicated by Calcutta firms lie between Rs. 1,00,000 & Rs. 1,50,000/- for 200 ton barge each and Rs. 2,00,000/- & Rs. 2,50,000/- for 150 B.H.P. tugs each.

Considering therefore, that a bulk order is placed for these vessels, the initial costs of 200 ton barges and 150 B.H.P. tugs each are assumed as Rs. 1,15,000/- and Rs. 2,00,000/- respectively.

2. The power required for the tugs has not been calculated : rather the practice in other countries for similar requirements (both from the point of view of load and speed) has been taken into consideration, and this is assumed as 150 B.H.P.

3. Overhead Establishment & Audit Charges :

In the absence of sufficient statistical information on the subject, suitable percentage rates could not be obtained from the Mercantile Marine Dept., or from the Calcutta Port Commissioners.

As however, indicated by some of the local Private Shipping Companies, the rates on the accumulated capital has been assumed as 2% being composed of overhead and audit charges @ 1½% and establishment 1½%.

4. Repairs and Maintenance Charges :

For similar reasons, as explained in the foregoing paragraph, the rate indicated by some of the local Shipping establishments as 4% of the accumulated capital, has been assumed here also.

5 Depreciation : Life of Vessels :

Life of crafts is generally very much higher in Europe than in U.S.A., though different crafts have different lives. While dumb barges have an average life of 50 years in Europe, it is only 20 years in U.S.A. Similarly, diesel engines have a life of 20 years in Europe while it is only 10—15 years in U.S.A. No dependable figures are however available for similar crafts in our country under comparable circumstances.

An average life of 30 years has therefore been assumed in our case for barges as well as for tugs and the depreciation calculated accordingly.

6. Taking into consideration the present rate of interest paid on capital, this has been assumed as 4½% (simple).

Similarly, in the case of contribution towards sinking fund, a compound interest at the same rate has been allowed.

APPENDIX IV.**LEFT BANK NAVIGATION CANAL D.V.C.****DAFT RULES AND REGULATIONS.**

These Rules shall be called D.V.C. Navigation Rules.

I DEFINITION :

(a) "Vessel" includes any ship, barge, boat, raft or craft or any other thing whatever designed or used for the transport upon water of passengers or goods.

(b) "Cargo boat" means any boat which ordinarily carries all kinds of moveable or personal property including animals.

(c) "Flat" means a decked in boat which can ply only in tow of an inland steam vessel.

(d) "Inland power driven vessel" means any vessel which is subject to the provision of the Inland Steam Vessels Act 1917 (1 of 1917).

(e) "Goods" include wares and merchandise of every description as well as livestock.

(f) "Owner" when used in relation to goods, includes any consignee, shipper or agent for the sale or custody thereof and when used in relation to any vessel, includes any part owner, charterer, consignee, mortgagee or agent in charge thereof.

(g) "Wharf" includes any bank of the canal which may be improved to facilitate the loading or unloading of goods and any foreshore used for the same and any wall enclosing or adjoining such bank or foreshore.

(h) A flat or boat exceeding the registered measurement of 10 tons shall have her load line, which shall at no time be submerged, indicated by conspicuous mark out into the hull and painted white on dark ground.

(i) The crew assigned for a flat or cargo boat shall be in accordance with the regulations laid down by the Mercantile Marine Department from time to time.

(j) "Passenger boat" means any boat which ordinarily carries other persons in addition to the normal 'Manjhi' or Boatman in charge and the crew.

(k) Every boat licensed to carry passengers shall exhibit a passenger plate on which shall be shown in English, Hindi and Bengali the registered number of the boat, the license number, the number of passengers authorised to carry and the number of her crew.

(l) Every passenger boat plying in the canal shall carry such number of Dandees and Manjhis as laid down by the Mercantile Marine Department.

(m) The license of a passenger boat must be produced for inspection at the request of any passenger.

II LICENSE AND TOLL :

1. Every Manjhi in charge of a vessel plying in the canal shall carry his own license and the license of his flat or boat, each of which shall be produced whenever it is required by police or by an officer duly authorised by the Corporation.
2. Every license granted under these rules to use the canal facilities shall continue in force for one year from the date on which it is granted unless it is duly revoked.
3. Every boat or flat arriving in the canal without a license or with a license which has expired and wishing to discharge cargo shall at once apply for an unloading permit at the nearest canal office.
4. The registered number of a flat or boat granted under I.S.V. Registration rules shall remain in force as an identification number throughout the whole working life of the flat or boat and subject to such rules as may be in force from time to time.
5. Tolls at such rates as shall be fixed must be paid in respect of all vessels entering upon, or passing along, the canal provided that such tolls shall be payable only so long as such line of navigation shall be open.
6. Notification of the rates of toll, and of places of collection, shall be at all time exhibited to public view at every toll-house where toll is levied under this Act, in English, Hindi and Bengali language.
7. Any person who shall refuse or evade or attempt to evade any toll shall be punished.

III DEMURRAGE.

1. Every vessel, raft or flat, which has paid toll, shall be allowed four days for passing through the canal, the days of entering and leaving being both included. In addition to these four days they may without further payment, remain in the canals for further periods as may be allowed by the Corporation from time to time.
2. All vessels, whether the property of Government or owners are liable for toll except those specially exempted under any Government orders in force for the time being.

IV EXCEPTED ARTICLES.

1. Refusal of objectionable cargo—The Corporation may refuse to land for import or receive for export any exceptional cargo of dangerous or objectionable nature which will, in their opinion imperil the safety of persons or damage the flooring the shed or quay or any part of the property or injuriously affect any other cargo.
2. Notice for excepted articles—Owners of vessels shall give 24 hours' notice before excepted articles are landed for import or received for export. Delivery must be taken by importers immediately after such articles are landed by the vessels and shipment must be made by the vessels immediately after such articles are received from exporters.

3. Landing of Carbide of Calcium—Carbide of Calcium shall not be landed without the express permission of the Superintendent. Permission shall be given only when the owner of the Carbide of Calcium is present and ready to take delivery.

4. Cylinders containing gases and liquids—Packages consisting of cylinders containing gases and liquids under pressure shall not be stored nor discharged from or shipped into vessels unless they comply in every respect as to construction marking etc., with the Gas Cylinder Rules 1940. All working precaution prescribed in the Gas Cylinder Rules 1940 must also be carefully taken and in addition, the following working restrictions must be strictly observed :—

- (i) Discharge or loading at night of Cylinders containing gases or liquids under pressure is prohibited.
- (ii) Cylinders containing gasses or liquids under pressure may be discharged on the wharf for direct delivery.

V FIRE-ARMS :

- 1. No loaded gun or other loaded fire-arm shall be kept on board any vessel in the canal.
- 2. Discharge of objectionable liquids prohibited—No person shall—
 - (a) Wilfully discharge, into the canal or into or on to any Wharf, any petroleum or other inflammable liquid.
 - (b) Wilfully throw any liquid of a noxious character or any filth or rubbish into the water of the canal.
- 3. Precautions against fire—No person shall use any unprotected fire or light or smoke tobacco or other substance or ignite matches or other inflammable articles in any shed or warehouse or any pier or quay or near a hatchway or in a hold of any vessel.
- 4. Heating or cooking fires—Fires of coal, charcoal or coke are permitted in the cabins, deck-houses, forecastles and cabooses or vessels in the canal, provided that the Corporation may on any abuse of this permission, prohibit or restrict the lighting of fires on board.
- 5. Ashes and rubbish—No ashes, sweepings or rubbish of any kind shall be thrown or suffered to fall or land at any point of the canal except under such conditions as are approved by the Corporation.

VI GENERAL :

- 1. Protection of navigable waters :—(1) No person shall—
 - (a) Lay or place any cargo, goods or other articles, likely after falling into the water, to be or to become detrimental to navigation or to cause damage to shipping, upon any wharf or jetty, nor upon any vessel in such a position that the same or any part of the same is likely to fall into the water.

- (b) Cast or throw or permit or suffer any balast or rubbish or any cargo, goods or other such article substance or thing at last aforesaid to fall into the canal.
2. Idle boats prohibited at Wharves—No boat shall lie at the Wharves except while it is receiving or discharging cargo.
3. No vessel shall anchor inside the canal in such a position or in such a manner, as to offer obstruction to the Navigation Canal.
4. Fastening of boats—No boat, cargo or lighter shall be fastened to any rail or crane or to any moveable structure in the canal.
5. Hawker's license—No person shall, without a license from D.V.C. offer goods for sale on a wharf or on a vessel lying at or within the limits of a wharf.
6. No fire or open or unprotected light of any description shall be used on vessel containing petroleum, jute, hay or straw.
7. No vicious animal shall be kept on board any vessel in the canal.
8. Vessels may be hauled up for repairs on the banks of canals, with the previous written permission of the Supervisor appointed by the Corporation. A rent calculated at half the rate of ordinary demurrage will be charged for the time the vessel occupies the bank. No vessel may be launched in the canal without the previous written permission of the Supervisor.
9. At places where mooring posts have been provided by the Supervisor, vessels desiring to moor shall be made fast in a single line along the banks to such posts in such manner as the Supervisor shall direct and shall not be moored in any other manner.
10. No boat shall sail in the canal.
11. Only one line of boats shall be allowed to pass through the canal line in one direction. Boats will only be allowed to make fast in a single line along the canal bank or the banks of the river entrance to the lock.
12. Heavily laden boats with draughts greater than the depth of the canal will not be permitted to enter the canal. The limiting draught will be specified by the Supervisor for the different levels of the canal.
13. No person shall wilfully or negligently allow a vessel to sink in the canal. No vessel, which is obviously overloaded or unseaworthy will be permitted to proceed along any part of the canal until made safe to the satisfaction of the Supervisor or his staff.
14. In every case of a sunken vessel, whether due to negligence or otherwise the Supervisor, and his subordinates shall offer every assistance in removing the same.

15. If three days after the occurrence of the wreck, it is seen that prompt measures are not being taken by the owner to remove the sunken vessel from the line of navigation, the Supervisor and his subordinates shall make their own arrangements for the removal of the same to the expense of the owner provided that when the wreck obstructs the fairway, they shall take immediate steps to remove the same.

16. Owners or crew of craft using the canal shall have to compensate the Damodar Valley Corporation for any loss or damage to Corporation property.

17. Removal of Projections—All projections from a vessel which are likely to impede or obstruct her movement, or damage any quay equipment or interfere at any time with the loading or discharging of other vessels, shall be removed on requisition by a duly authorised officer of the Corporation.

18. Interference with equipment prohibited—No person shall open or attempt to open, or shut or attempt to shut, any lock gate, sluice valve, or otherwise interfere with any machinery or apparatus without orders from a duly authorised officer of the Corporation.

19. No vessel whose extreme breadth including overhanging cargo exceeds 18 feet will ordinarily be permitted through the lock, the maximum width available in the locks being 20 feet.

20. Vessels shall be allowed to make fast in single line along the canal banks in such manner as may be directed by the Supervisor, and no vessel shall be made fast or to be placed outside of vessels so secured. No vessel or craft shall be placed in such a position as to endanger the safety, or obstruct the passage of other vessels. Every vessel shall at all times have some responsible person on board.

21. Iron built cargo boats, with outside single iron projecting beyond the wooden fenders, will not be allowed to enter the locks unless permanent fenders are fixed over the edges of the angle irons so as to prevent them from causing damage to the lock.

22. Searching of boats—Any boat, cargo or lighter may be searched before leaving the canal, by the Police or any officer duly authorised by the Corporation.

23. These rules are subject to :

(1) I. S. V. Regulations.

(2) C.P.C. Regulations.

LEFT BANK NAVIGATION CANAL D.V.C.

RULES FOR NAVIGATION AND PREVENTION OF COLLISION IN THE CANAL.

Rule No. 1 :

- (a) These Rules shall be followed by all vessels while in the canal.
- (b) The Rules concerning lights shall be complied with in all weather from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the prescribed lights or impair the visibility of distinctive character, or interfere with the keeping of proper look-out.
- (c)
 - (i) The word "Vessel" includes every description of water craft other than a sea-plane on the water, used or capable of being used as a means of transportation on water.
 - (ii) The term "power driven vessel" means any vessel propelled by machinery.
 - (iii) Every power-driven vessel which is under sail not under power is to be considered a sailing vessel, and every vessel under power, whether under sail or not, is to be considered a power driven vessel.
 - (iv) A vessel or sea-plane on the water is "under way" when she is not at anchor, or made fast to the shore or aground.
 - (v) The length and breadth of a vessel shall be deemed to be the length and breadth appearing in her certificate of registry.
 - (vi) The word "visible" when applied to lights, means visible on a dark night with a clear atmosphere.
 - (vii) The term "short blast" means a blast of about one second's duration.
 - (viii) The word "whistle" means whistle or siren.
 - (ix) The word "tons" means gross tons.

Rule No. 2 :

- (a) A power-driven vessel when under way shall carry—
 - (i) On or in front of the foremast, or if a vessel without a foremast then in the forepart of the vessel, a bright white light so constructed as to show an unbroken light over an arc of the horizon of 20 points of the compass ($22\frac{1}{2}$ degrees) so fixed as to show the light 10 points ($112\frac{1}{2}$ degrees) on each side of vessel, that is, from right ahead to 2 points ($22\frac{1}{2}$ degrees) abaft the beam on either side and of such character as to be visible at a distance of at least 3 miles.
 - (ii) On the Starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of 10 points of the Compass ($112\frac{1}{2}$ degrees) so fixed as to show the light from right ahead to 2 points ($22\frac{1}{2}$ degrees) abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least 2 miles.
 - (iii) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of 10 points of the compass ($112\frac{1}{2}$ degrees) so fixed as to show the light from right ahead to 2 points ($22\frac{1}{2}$ degrees) abaft the beam on the port side and of such a character as to be visible at a distance of at least 2 miles.

Rule No. 3 :

- (a) A power-driven vessel when towing or pushing another vessel shall in addition to her side lights, carry two bright white lights in a vertical line one over the other not less than 3 feet apart, and when towing more than one vessel shall carry as additional bright white light (3) feet above or below such lights, if the length of the tow measuring from the stern of the towing vessel to the stern of the last vessel towed, exceeds 600 feet. Each of these lights shall be of the same construction and character and one of them shall be carried in the same position as the white light mentioned in Rule 2(a) (i), except the additional light which shall be carried at a height of not less than (3) feet above the hull. In a vessel with a single mast, such lights may be carried on the mast.
- (b) The towing vessel shall also show either the stern light specified in Rule 10 or in lieu of that light a small white light abaft the funnel or after mast for the tow to steer by, but such light shall not be visible forward of the beam. The Carriage of the white light specified in Rule 2(a) (ii) is optional.

Rule No. 4 :

- (a) A vessel which is not under command shall carry, where they can best be seen, two red lights in a vertical line one over the other not less than (3) feet apart and of such a character as to be visible all round the horizon at a distance of at least 2 miles. By day, she shall carry in a vertical line one over the other not less than (3) feet apart, where they can best be seen two black balls or shapes each not less than (1) feet in diameter.
- (b) The vessels referred to in this Rule, when not making way through the water, shall not carry the coloured sidelights, but when making way they shall carry them.
- (c) The lights and shapes required to be shown by this Rule are to be taken by other vessels and seaplanes as signals that the vessel showing them is not under command and cannot therefore get out of the way.
- (d) These signals are not signals of vessels in distress and requiring assistance. Such signals are contained in Rule 21.

Rule No. 5 :

- (a) A sailing vessel underway and any vessel being towed shall carry the same lights as are prescribed by Rule 2 for a power-driven vessel or a seaplane underway, respectively with the exception of the white lights specified therein, which they shall never carry. They shall also carry stern lights as specified in Rule 10, provided that vessels towed except the last vessel of a tow, may carry, in lieu of such stern light a small white light as specified in Rule 3(b).
- (b) A vessel being pushed ahead shall carry, at the forward end, on the starboard side a green light and on the portside a red light, which shall have the same characteristics as the lights described in Rule 2(a) & (iv) and (v) and shall be screened as provided in Rule 2(a) (vi) provided that any number of vessels pushed ahead in a group shall be lighted as one vessel.
- (c) Small rowing boats, whether under oars or sail, shall only be required to have ready at hand an electric torch or a lighted lantern showing a white light, which shall be exhibited in sufficient time to prevent collision.

- (d) The vessels and boats referred to in this Rule shall not be required to carry the lights or shapes prescribed in Rule 4(a).

Rule No. 6 :

A vessel when under way shall carry at her stern a white light, so constructed that it shall show an unbroken light over an arc of the horizon of 12 points of the compass (135) degrees so fixed as to show the light 6 points ($67\frac{1}{2}$ degrees) from right aft on each side of the vessel, and of such a character as to be visible at a distance of at least (1) mile. Such light shall be carried as nearly as practicable on the same level as the side lights.

Rule No. 7 :

- (a) A vessel when at anchor, shall carry in the forepart of the vessel, where it can best be seen, a white light in a lantern so constructed as to show a clear, uniform and unbroken light visible all round the horizon at a distance of at least (1) mile.
- (b) Between sunrise and sunset every vessel when at anchor shall carry in the forepart of the vessel, where it can best be seen one black ball not less than (1) foot in diameter.
- (c) A vessel aground shall carry by night the light or lights prescribed in sections (a) or (b) and the two red lights prescribed in Rule 4(a). By day she shall carry, where they can best be seen, three black balls, each not less than (1) foot in diameter, placed in a vertical line one over the other, not less than (3) feet apart.

In fog, mist, falling snow, heavy rain, storms or any other conditions similarly restricting visibility whether by day or night the signals prescribed in these Rules shall be used as follows :—

Rule No. 8 :

- (a) A power-driven vessel making way through the water shall sound at intervals of not more than (1) minute a prolonged blast.
- (b) A power-driven vessel under way, but stopped and making no way through the water, shall sound at intervals of not more than (1) minute two prolonged blasts, with an interval of about 1 second between them.
- (c) A vessel when at anchor shall at intervals of not more than one minute ring the bell rapidly for about 5 seconds.
- (d) A vessel when towing and a vessel under way which is unable to get out of the way of an approaching vessel through being not under command or unable to manoeuvre as required by these Rules shall instead of the signals prescribed in sub-sections (a) (b) and (c) sound, at intervals of not more than 1 minute, three blasts in succession, namely one prolonged blast followed by two short blasts.
- (e) A vessel aground shall give the signal prescribed in sub-section (b) and shall in addi-

tion, give three separate and distinct strokes on the bell immediately before and after each such signals.

- (f) All other vessels shall not be obliged to give the abovementioned signals, but if they do not, they shall make some other efficient sound signals at intervals of not more than 1 minute.

Rule No. 9 :

- (a) Every vessel, shall, in fog, mist, heavy rain-storms or any other condition similarly restricting visibility, go at a moderate speed, having careful regard to the existing circumstances and conditions.
- (b) A power driven vessel hearing, apparently forward of her beam the fog signal of a vessel of the position of which is not ascertained shall for as the circumstances of the date admit, stop her engines and then navigate with caution until danger of collision is over.

Rule No. 10 :

- (a) When two power-driven vessels are meeting end on, or nearly end on so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other. This Rule only applies to cases where vessels are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two vessels which must, if both keep on their respective course, pass clear of each other, the only cases to which it does apply are when each of two vessels in end on, or nearly end on, to the other, in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line, with her own, and by night, to cases in which each vessel is in such a position as to see both the sidelight, of the other. It does not apply, by day, to cases in which a vessel sees another ahead crossing her own course or by night, to cases where the red light of one vessel is opposed to the red light of the other or where the green light of one vessel is opposed to the green light of the other or where a red light without a green light or a green light without red light is seen ahead or where both green and red lights are seen anywhere but ahead.

Rule No. 11 :

- (a) When two power-driven vessels crossing, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other.
- (b) Traffic proceeding upwards towards Durgapur shall have priority over the downward traffic in the matter of crossings.

Rule No. 12 :

When a power driven vessel and any other vessel are proceeding in such directions as to involve risk of collision, except as provided in Rules 14 and 16, the power driven vessel shall keep out of the way of the other vessel.

Rule No. 13 :

Where by any of these Rules one of two vessels is to keep out of the way, the other shall keep her course and speed. When, from any cause, the latter vessel finds herself so close that collision cannot be avoided by the action of the giving way vessel alone, she also shall take such action as will best aid to avert collision. (See rules 18 and 20).


Rule No. 14 :

Every vessel which is directed by these Rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

Rule No. 15 :

Every power-driven vessel which is directed by these Rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

Rule No. 16 :

- 
- (a) Notwithstanding anything contained in these Rules, every vessel overtaking any other shall keep out of the way of the overtaken vessel.
 - (b) Every vessel coming up with another vessel from any direction more than 2 points ($22\frac{1}{2}$ degrees) abaft her beam i.e., in such a position, with reference to the vessel which she is in such a position, with reference to the vessel which she is overtaking, that at night she would be unable to see either of that vessel's sidelights, shall be deemed to be an overtaking vessel, and no subsequent alternation of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these Rules or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.
 - (c) If the overtaking vessel cannot determine with certainty whether she is forward of or abaft this direction from the other vessel, she shall assume that she is an overtaking vessel and keep out of the way.

Rule No. 17 :

- (a) In a narrow channel every power-driven vessel when proceeding along the course of the channel shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which lies on the starboard side of such vessel.

- (b) Whenever a power-driven vessel is nearing a bend in a channel where a power-driven vessel approaching from the other direction cannot be seen, such vessel, when she shall have arrived within one half mile of the bend, shall give a signal by one prolonged blast of her whistle, which signal shall be answered by a similar blast given by any approaching power-driven vessel that may be within hearing around the bend. Regardless of whether an approaching vessel on the further side of the bend is heard, such bend shall be rounded with, alertness and caution.

Rule No. 18 :

In obeying and construing these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances including the limitations of the craft involved, which may render a departure from the above Rules necessary in order to avoid immediate danger.

Rule No. 19 :

- (a) When vessels are in sight of one another, a power driven vessel underway, in taking any course authorised or required by these rules, shall indicate that course by the following signals on her whistle, namely :
One short blast to mean " I am altering my course to starboard."
Two short blasts to mean " I am altering my course to port." **Three short blasts** to mean " My engines are going astern."
- (b) Whenever a power-driven vessel which under these Rules, is to keep her course and speed, is in sight of another vessel and is in doubt whether sufficient action is being taken by the other vessel to avert collision, she may indicate such doubt by giving at least five short and rapid blasts on the whistle. The giving of such a signal shall not, relieve a vessel of her obligations under Rules 18 and 20 or any other Rule or of her duty to indicate any action taken under these Rules by giving the appropriate sound signals laid down in this Rule.
- (c) Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to the use of additional whistle signals between ships of war or vessels sailing under convoy.

Rule No. 20 :

Nothing in these Rules shall exonerate any vessel, or the owner, master, or crew thereof, from the consequence of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seaman, or by the special circumstances of the case.

Rule No. 21 :

When a vessel is in distress and requires assistance from other vessel or from the shore, the following shall be the signals to be used or displayed by her, either together or separately namely :

- (a) A continuous sounding with any fog signal apparatus.
- (b) A signal consisting of a square flag having above or below of a ball or anything resembling a ball.

The use of any of the above signals, except for the purpose of indicating that a vessel is in distress, and the use of any signals which may be confused with any of the above signals, is prohibited.

Rule No. 22 :

All orders to helmsman shall be given in the following sense, right rudder or starboard to mean "put the vessel's rudder to starboard left rudder or port to mean "Put the vessel's rudder to port."



Explanatory Note on Statement II.

1. Upward traffic being small, it has been assumed that return barges on upward journey will carry this traffic.
2. Inside traffic is assumed to be composed of upward and downward traffic equally.
3. Inside upward traffic is also assumed to be borne by barges on their upward journey.
4. Working traffic (Col. 5) has been assumed as Col. 3 + Col. 4.
5. Requirement of 200 ton barges :

The turn round period for barges is assumed as 9 days. Taking 360 days in a year, the requirement is

$$\frac{\text{working traffic} \times 9}{200 \times 360}$$

6. Requirement of tugs :

(a) Each tug is assumed to tow two barges in the downward and four in the upward journey vide recommendation of Sub-Committee on "Determination of Shape & Sizes of Barges and Tugs" during its first meeting. Average number of barges towed is therefore 3.

(b) Turn round period :

- 21 hours for travelling in the canal.
- 11 hours for lying in the locks.
- 8 hours for Hooghly journey.
- 35 hours for empty return journey.
- 5 hours for waiting time.

80 hours total, i.e. 5 days' turn round time.

7. 5% extra barges & tugs than the actual requirement has been provided upto 1971-72. After this, a provision of 10% extra barges and tugs has been made as stand by at an uniform rate.

Requirement of tugs is therefore,

$\frac{\text{No. of barges} \times 5}{9}$ i.e. $\text{No. of barges} \times \frac{5}{18}$.

**PROJECTED GROWTH OF CANAL
TRAFFIC COMMODITY WISE**

(Tons)

STATEMENT I

Year	Coal downward	Paddy downward.	Construc- tion mate- rials down- ward.	Colliery Stores (Upwards)	Industrial products (down- wards)	Misce- llaneous (Inside)	Total Tons.
58-59	12,000	6,000	1,000	500	-	500	20,000
59-60	1,50,000	50,000	50,000	5,000	25,000	20,000	3,00,000
60-61	2,75,000	50,000	75,000	20,000	50,000	30,000	5,00,000
61-62	4,05,000	1,00,000	75,000	40,000	50,000	30,000	7,00,000
62-63	4,05,000	1,00,000	75,000	40,000	50,000	30,000	7,00,000
63-64	5,60,000	1,25,000	1,25,000	50,000	1,00,000	40,000	10,00,000
64-65	5,60,000	1,25,000	1,25,000	50,000	1,00,000	40,000	10,00,000-
65-66	6,10,000	2,00,000	1,25,000	50,000	1,75,000	40,000	12,00,000
66-67	6,10,000	2,00,000	1,25,000	50,000	1,75,000	40,000	12,00,000
67-68	7,50,000	3,00,000	1,50,000	50,000	2,00,000	50,000	15,00,000
68-69	8,00,000	3,50,000	1,50,000	50,000	2,00,000	50,000	16,00,000
69-70	9,00,000	4,00,000	2,00,000	50,000	2,00,000	50,000	18,00,000
70-71	10,00,000	5,00,000	2,00,000	50,000	2,00,000	50,000	20,00,000
71-72	10,00,000	5,00,000	2,00,000	50,000	2,00,000	50,000	20,00,000

- - - - -

sk:

Programme of yearly requirement
of barge tugs for Navigation
canal.

Expected traffic in tons				Requirement of 200 barges = Working traffic x 9		Requirement of 150 barges = No. of barge x 5/18		Actual 1971-72 & there- after to make up to 10% extra.		Actual 1971-72 & there- after to make up to 10% extra.		Requirement of 150 barges = No. of barge x 5/18	
2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Upward	Downward	Inside	Working	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.	Actual 1971-72 & there- after to make up to 10% extra.
500	19,000	500	19,250	2	1	3	2	2	2	2	2	2	2
5,000	2,75,000	20,000	2,85,000	36	2	38	11	11	11	11	11	11	11
20,000	4,50,000	20,000	1,55,000	57	3	60	15	15	15	15	15	15	15
40,000	6,30,000	30,000	6,45,000	81	4	85	23	23	23	23	23	23	23
40,000	6,30,000	30,000	6,45,000	81	4	85	23	23	23	23	23	23	23
50,000	9,10,000	40,000	9,30,000	116	6	122	32	32	32	32	32	32	32
50,000	9,10,000	40,000	9,30,000	116	6	122	32	32	32	32	32	32	32
50,000	11,10,000	40,000	11,30,000	141	7	148	39	39	39	39	39	39	39
50,000	11,10,000	40,000	11,30,000	141	7	148	39	39	39	39	39	39	39
50,000	14,00,000	50,000	14,25,000	178	9	187	50	50	50	50	50	50	50
50,000	15,00,000	50,000	15,25,000	190	10	200	53	53	53	53	53	53	53
50,000	17,00,000	50,000	17,25,000	215	11	226	60	60	60	60	60	60	60
50,000	19,00,000	50,000	19,25,000	240	12	252	67	67	67	67	67	67	67
50,000	19,00,000	50,000	19,25,000	240	12	252	67	67	67	67	67	67	67
50,000	19,00,000	50,000	19,25,000	240	14	254	66	66	66	66	66	66	66
50,000	19,00,000	50,000	19,25,000	240	16	256	66	66	66	66	66	66	66
50,000	19,00,000	50,000	19,25,000	240	18	258	66	66	66	66	66	66	66
50,000	19,00,000	50,000	19,25,000	240	20	260	66	66	66	66	66	66	66
50,000	19,00,000	50,000	19,25,000	240	22	262	66	66	66	66	66	66	66
50,000	19,00,000	50,000	19,25,000	240	24	264	66	66	66	66	66	66	66

Statement III

Promotion of Navigation Traffic
inside DVC Navigation Canal

Detail of working expenditure:

- (i) Cost of fuel, lubricant etc. for tugs year by year consumption of fuel @ 0.36 lbs/Bhp./ hr. / pp. 1687 of Eng. year Book for 150 Hp. tugs, consumption of diesel oil per hour = 5.8 gals/hr. i.e. 93 gls/day of 16 hrs. @ 1/6/- per gl. cost of fuel per day = Rs.128/- Cost of lubricant @ 10% of fuel per day = Rs.12/-.

Cost of fuel and lubricant per day = 140/- or Rs.50,000/- annually, considering double number of empty barges to be towed in the return journey and idle tugs can be towed back. Cost of fuel etc. has been calculated for only $\frac{2}{3}$ th of the actual no. of tugs required.

Year	$\frac{2}{3}$ th Actual number of tugs required.	Cost of fuel and lubricant per year
1958-59	2	1,00,000/-
1959-60	8	4,00,000/-
1960-61	11	5,50,000/-
1961-62	17	8,50,000/-
1962-63	17	8,50,000/-
1963-64	24	12,00,000/-
1964-65	24	12,00,000/-
1965-66	29	14,50,000/-
1966-67	29	14,50,000/-
1967-68	37	18,50,000/-
1968-69	40	20,00,000/-
1969-70	45	22,50,000/-
1970-71	49	24,50,000/-
1972-73	49	24,50,000/-
1973-74	49	24,50,000/-
1974-75	49	24,50,000/-
1975-76	49	24,50,000/-
1976-77	49	24,50,000/-
1977-78	49	24,50,000/-

Statement IV

Details of Working Expenditure
(Pay of Khalasi, Crew etc.)

Year	Barges @ 4,475/-		Tugs @ Rs.11,700		Total operational expenditure annually.
	annually		annually		
	No.	Annual Expenditure	No.	Annual Expenditure	
58-59	3	13,000/-	2	23,000/-	36,000/-
59-60	38	1,70,000/-	11	1,29,000/-	2,99,000/-
60-61	60	2,68,000/-	16	1,87,000/-	4,55,000/-
61-62	85	3,80,000/-	24	2,80,000/-	6,60,000/-
62-63	85	3,80,000/-	24	2,80,000/-	6,60,000/-
63-64	122	5,45,000/-	33	3,85,000/-	9,30,000/-
64-65	122	5,45,000/-	33	3,85,000/-	9,30,000/-
65-66	148	6,60,000/-	41	4,80,000/-	11,40,000/-
66-67	148	6,60,000/-	41	4,80,000/-	11,40,000/-
67-68	147	8,35,000/-	52	6,10,000/-	14,45,000/-
68-69	200	8,95,000/-	56	6,55,000/-	15,50,000/-
69-70	226	10,10,000/-	63	7,36,000/-	17,46,000/-
70-71	252	11,25,000/-	69	8,05,000/-	19,30,000/-
71-72	252	11,25,000/-	69	8,05,000/-	19,30,000/-
72-73	254	11,35,000/-	70	8,28,000/-	19,63,000/-
73-74	256	11,45,000/-	71	8,30,000/-	19,75,000/-
74-75	258	11,55,000/-	72	8,42,000/-	19,97,000/-
75-76	260	11,65,000/-	73	8,54,000/-	20,19,000/-
76-77	262	11,70,000/-	73	8,54,000/-	20,24,000/-
77-78	264	11,80,000/-	73	8,54,000/-	20,34,000/-
78-79	264	11,80,000/-	73	8,54,000/-	20,34,000/-
79-80	264	11,80,000/-	73	8,54,000/-	20,34,000/-

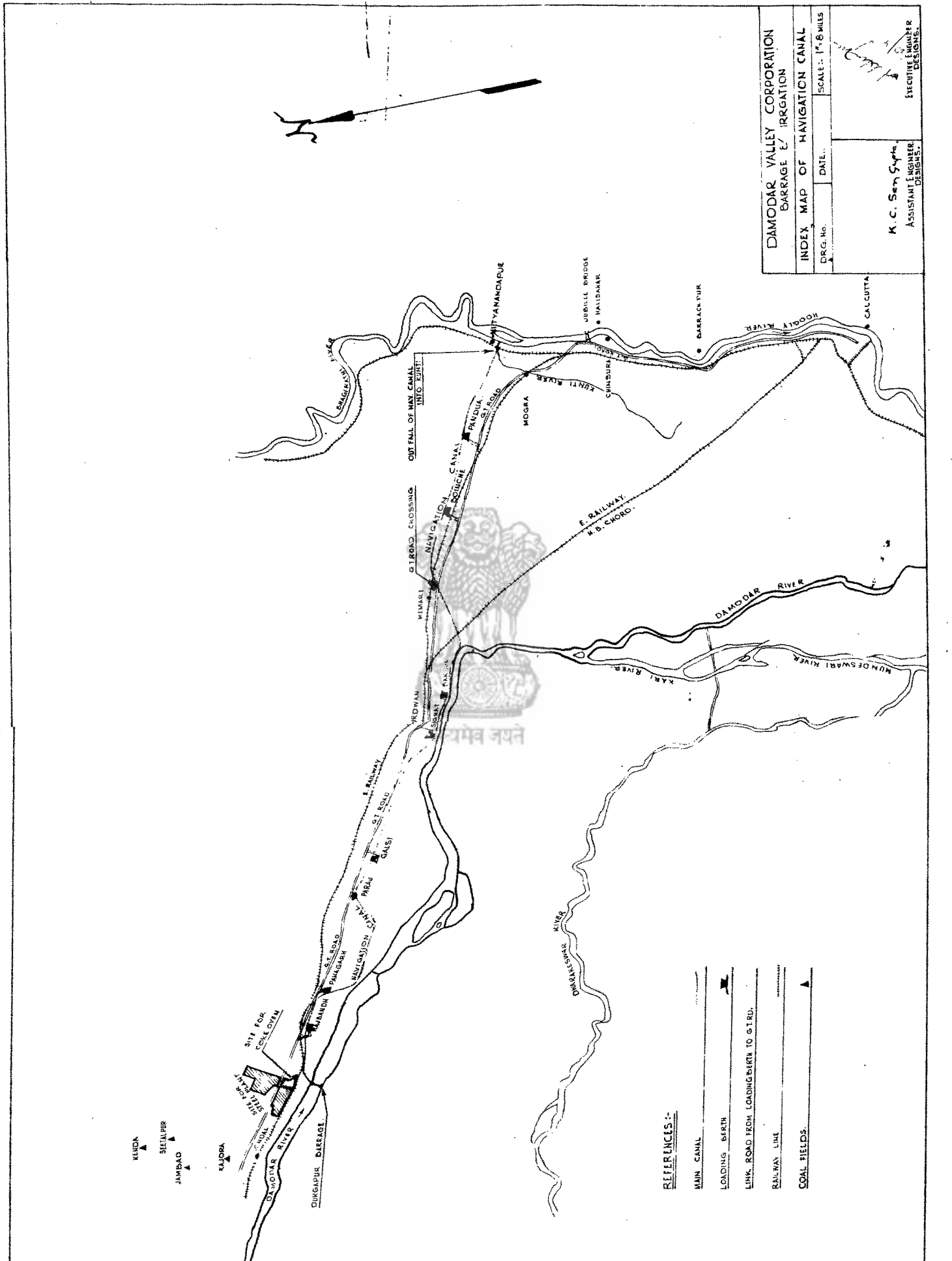
Statement - VII

Year	Cumulative capital outlay (as per Statement - V.)	Nett Revenue (As per Column 15 of Statement - VI)	Simple interest (As per 'A' of Statement V.)	Nett Revenue less interest.	Percentage Return.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1958-59	8,08,000	-	36,000	-	-	The percentage return has been worked out excluding the interest as Capital outlay.
1959-60	66,63,000	2,55,250	3,00,000	-	-	
1960-61	1,02,41,000	6,62,875	4,61,000	2,01,875	1.95%	
1961-62	1,47,74,000	8,30,375	6,65,000	1,65,375	1.12%	
1962-63	1,48,39,000	8,27,375	6,66,000	1,61,375	1.08%	
1963-64	2,09,39,000	12,54,500	9,40,000	3,14,500	1.5%	
1964-65	2,09,89,000	13,00,500	9,45,000	3,55,000	1.7%	
1965-66	2,56,24,000	15,64,000	11,50,000	4,14,000	1.6%	
1966-67	2,56,69,000	15,84,000	11,51,000	4,33,000	1.7%	
1967-68	3,24,39,000	19,15,875	14,60,000	4,55,000	1.4%	
1968-69	3,47,79,000	20,14,375	15,55,000	4,59,375	1.32%	
1969-70	3,92,14,000	22,79,375	17,65,000	5,14,375	1.27%	
1970-71	4,34,49,000	26,17,375	19,55,000	6,62,375	1.52%	
1971-72	4,34,94,000	26,13,375	19,60,000	6,53,375	1.51%	

Statement - VIII

Year.	Cumulative capital outlay (As per statement-V.)	Simple interest (As per 'a' of Statement-V)	Cumulative interest.	Nett Revenue (As per Col.15 of Stt.-VI)	Cumulative nett revenue.	Sum at charge		Percentage		Remarks
						Col.2	Col.4	Col.5	Col.7.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
958-59	6,03,000	36,000	36,000	-	-	-	-	-	-	Interest capital lay has
959-60	66,63,000	3,00,000	3,36,000	2,55,250	2,55,250	67,43,750		3.8 %		capital
960-61	1,02,41,000	4,61,000	7,97,000	6,62,875	9,18,125	1,04,19,875		6.55%		in work
961-62	1,47,74,000	6,65,000	14,62,000	8,30,375	17,48,500	1,44,87,500		5.7%		at the
962-63	1,48,39,000	6,66,000	21,28,000	8,27,375	25,75,875	1,43,91,125		5.7%		centage
963-64	2,09,39,000	9,40,000	30,68,000	12,54,500	38,30,375	2,01,76,625		6.2%		return.
964-65	2,09,89,000	9,45,000	40,13,000	13,00,500	51,30,875	1,98,71,125		6.56%		
965-66	2,56,24,000	11,50,000	51,63,000	15,64,000	66,94,875	2,40,92,125		6.4%		
966-67	2,56,69,000	11,51,000	63,14,000	15,84,000	82,78,875	2,37,04,125		6.6%		
967-68	3,24,39,000	14,60,000	77,74,000	19,15,875	1,01,94,750	3,00,18,250		6.3%		
968-69	3,47,79,000	15,85,000	93,29,000	20,14,375	1,22,09,125	3,18,98,875		6.3%		
969-70	3,92,14,000	17,65,000	1,10,94,000	22,79,375	1,44,88,500	3,58,19,500		6.3%		
970-71	4,34,99,000	19,55,000	1,30,49,000	26,17,375	1,71,05,875	3,93,92,125		6.6%		
971-72	4,34,94,000	19,60,000	1,50,09,000	26,13,375	1,97,19,250	3,87,83,750		6.7%		

sk: 22-1-58
tl. No.



DAMODAR VALLEY CORPORATION
BARRAGE & IRRIGATION

INDEX MAP OF NAVIGATION CANAL

DRG. No. DATE: SCALE: 1" = 8 MILES

K. C. Sen Gupta
ASSISTANT ENGINEER
DESIGNS.

EXECUTIVE ENGINEER
DESIGNS.

REFERENCES:-

- MAIN CANAL
- LOADING BERTH
- LINK ROAD FROM LOADING BERTH TO GIRD.
- RAILWAY LINE
- COAL FIELDS